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Agriculture

Volume LXV Number 10

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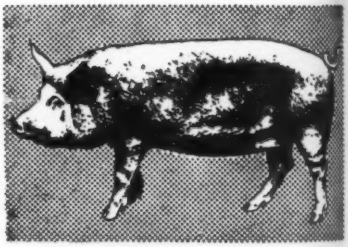

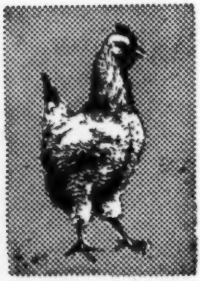

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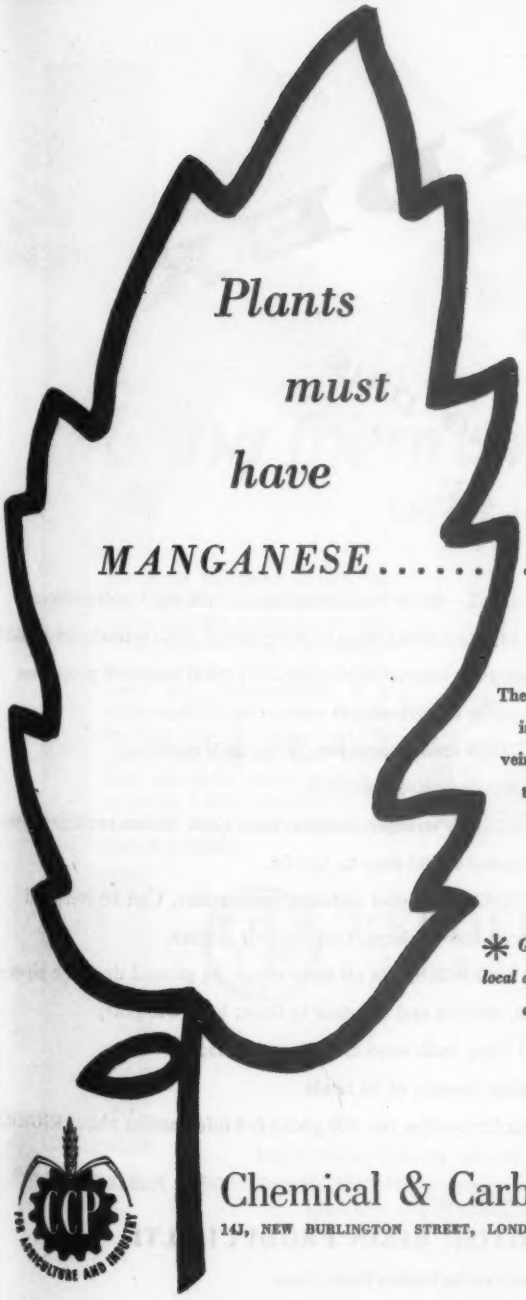

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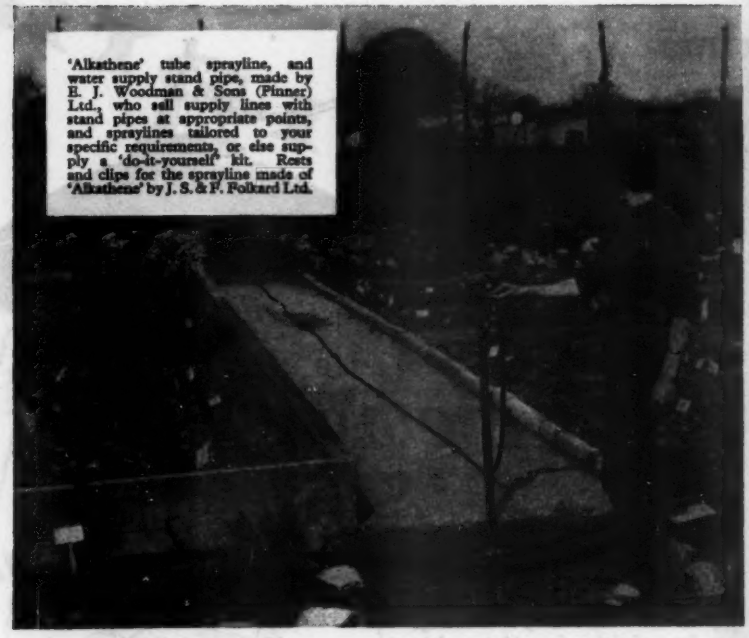

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Volume LXV Number 10 January 1959

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Cover photograph: The bag *Photo: John Tarlton*

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Breeding Better Kales

K. F. THOMPSON, M.A.
Plant Breeding Institute, Cambridge

Mr. Thompson considers some of the improvements which farmers have suggested should be made in kale, and outlines the work now in progress at Cambridge to produce better varieties.

THE growing importance of kales as autumn and winter forage crops, and recent changes in the management of the crop to reduce labour costs, suggest that there may be a need for new varieties better adapted to modern ways of management. Kales are still a relatively new crop for many farmers, and some of the opinions expressed on the improvements are conflicting.

While the separate commercial stocks of marrowstem kale in this country differ from each other in total yield, height and thickness of stem, leafiness and winter hardiness, greater differences for all these characters can be found among the plants of one commercial stock. This variation within available commercial stocks is seldom important to the farmer, but for the production of special-purpose varieties such as a short-stemmed type for strip grazing with electric fencing, uniformity of type would be essential.

Both marrowstem and thousandhead kales are almost always cross-fertilized plants. Most stocks are therefore a genetically mixed population, and each plant is of hybrid origin. Thus no selection will breed true to type, and it will be difficult to reduce the variability within stocks much while present methods of mass selection are used to produce new kale stocks. The Plant Breeding Institute has therefore investigated the possibility of applying to kale the double-cross hybrid method which has been used so successfully to increase the uniformity and yield of maize in America.

Producing a consistent stock

Relatively true breeding lines of kale can be obtained by selfing selections from commercial stocks by bud pollination for two generations. Kale plants are normally self-incompatible, that is they set no seed when pollinated with

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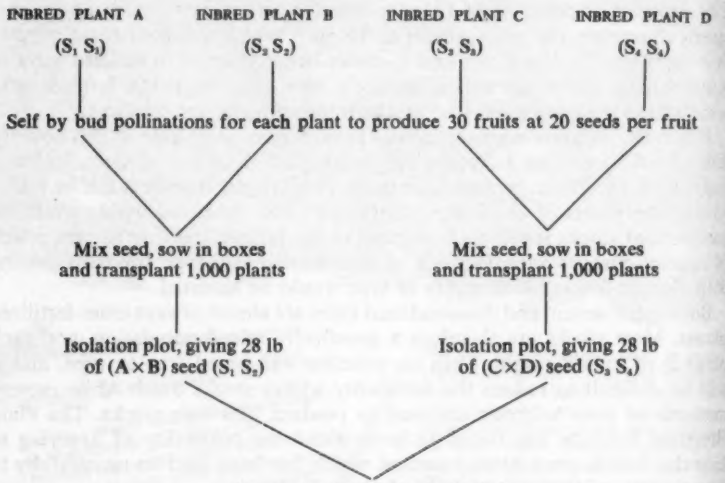
their own pollen at the open-flower stage. They do, however, set seed when crossed by another plant, which does not contain the same self-incompatibility factors (known to geneticists as the *S* alleles). Applying the knowledge which we now have about the self-incompatibility system in kales,[1, 2] it should be possible to make single and double-crosses between four inbred lines to obtain one hundred per cent double-cross hybrid seed on a commercial scale. Selfing selections to give inbred lines reduces vigour, but this is restored when two unrelated inbred lines are crossed.

Suggested method for producing double-cross hybrid seed of kale


INBRED PLANT A
(S1 S3)
INBRED PLANT B
(S2 S2)
INBRED PLANT C
(S3 S4)
INBRED PLANT D
(S4 S4)
Self by bud pollinations for each plant to produce 30 fruits at 20 seeds per fruit
Mix seed, sow in boxes and transplant 1,000 plants
Mix seed, sow in boxes and transplant 1,000 plants
Isolation plot, giving 28 lb of (A×B) seed (S1 S2)
Isolation plot, giving 28 lb of (C×D) seed (S3 S4)
Mix seed, sow in nursery bed and transplant about 50 acres—this will give seed of (A×B)×(C×D) for growing the commercial forage crop.

Note: Plants A, B, C and D have to be maintained by cuttings. Tota lacreage of marrowstem kale for seed is over 1,500 acres.

The double-cross seed would be used for growing the farm forage crop, but not for producing further seed. Each year double-cross hybrid seed would be produced from the chosen inbred lines, which would be maintained from year to year by vegetative propagation. Thus, a vigorous and uniform variety could be marketed, which would not vary from year to year. Although this method has not yet been tested on a commercial scale, there seems no reason why it should not prove satisfactory.

Relative value of leaf and stem

The statement has been made recently, both for marrowstem and thousandhead, that "the value of kale is entirely in the leaf". Chemical analysis does show that the kale leaf is, weight for weight, more nutritious than the stem, and also that leaves are entirely edible while there may be considerable

wastage of the rather woody stems in the field. However, these facts do not necessarily justify breeding solely for the maximum of leaf and the minimum of stem.

The results of yield trials with marrowstem, thousandhead and field cabbage at the National Institute for Research in Dairying have recently been published.[3] Over a four-year period, with and without top dressings of nitrogen, and harvesting from October until February in most years, marrowstem gave the highest yields per acre of fresh and dry weight and crude protein. These trials were cut, and therefore factors such as relative edibility were not considered. Since cabbage is practically all leaf, and thousandhead has much more leaf and holds it better than marrowstem, it is clear that the stem makes a very important contribution both to total yield and the nutritive value of the crop. It would thus appear that marrowstem has greater potentialities for agriculture than thousandhead and, although it is realized that thousandhead can be greatly improved, work on kales at Cambridge is mainly concerned with improving marrowstem.

Short marrowstem kale for strip grazing

The rapid rise in the cost of agricultural labour since the war has made the most profitable forage crop often the one that has the lowest labour requirements. Thus, although marrowstem does outyield the root crops both for starch and protein equivalent per acre, the lower cost of managing it has also contributed to the change from mangolds, swedes and turnips. Unlike the root crops, kale can be grown without singling (although, in future, precision drilling may make singling unnecessary for all root crops) and labour costs are further reduced by strip-grazing kale in the field with electric fencing, instead of lifting, carting, clamping and feeding the roots. Considerable wastage does, however, occur when marrowstem is grazed in the field; estimates vary from 20 to 40 per cent of the crop, depending on the method of grazing used.[4] Despite this wastage, it is often more profitable to strip-graze kale than to cut and cart it.[5]

Least wastage from strip grazing with electric fencing occurs when the wire is run just in front of the kale, so that the cattle cannot tread on the crop, and the fence is moved twice a day. This is only possible, however, when the kale is shorter than the wire. Since commercial stocks of marrowstem may in a wet season be 5 feet high, four or five rows are usually grazed at a time, the two innermost rows being cut down to make a path for the wire to run without risk of the kale shorting the electric circuit. Even then, tall plants and adjoining drills may lodge or be pushed on the wire by the cattle. Leaving blank drills where the wire will run, or sowing shorter "tracker crops" such as cabbage or hungry gap kale, has not proved satisfactory.[6] Later sowing, that is to say in the second half of June, with heavy manuring, has been increasingly practised in the wetter south-western part of the country to produce a short, leafier crop with edible stems but less total yield than a crop sown in April. This late sowing also enables the land to be cleaned of weeds by cultivations, but this cleaning is now unnecessary since a weed-killer, sodium monochloracetate, which kills charlock in kale has been marketed recently. In the drier eastern half of the country, late sowings would normally give very poor crops.

Thus a leafy, short-stemmed variety of marrowstem which would not grow taller than 3 feet when sown in April might be very valuable for strip grazing. Breeding for such a type has been in progress at the Plant Breeding Institute for six years, and the double-cross method of breeding has been used to ensure uniformity of height. Selection has also been made for thicker stems to compensate for the lower-yielding short stems, and it is hoped in addition to reduce wastage in the field by selection for stems with less wood near their bases, so that they can be grazed to the ground. This has been achieved without any loss in the amount of leaf produced, but edibility trials with cattle are only starting this year. Short-stemmed plants are also much less likely to lodge than taller ones, and this should also reduce wastage.

From trials at Cambridge, it appears that a short-stemmed type will probably give only 90 per cent of the total yield of a taller, commercial marrowstem stock. However, as has been pointed out above, farmers have already found it more profitable to sacrifice yield for easier management. A variety with short stems which can be grazed with less wastage and labour, may thus be more profitable than taller varieties with higher total yields. An April sowing of a short type would also yield more than a late sowing of the type of marrowstem available at present.

Winter-hardy marrowstem kale

It is generally agreed that a marrowstem kale variety with a much improved winter hardiness and a better leaf retention is required. Thousandhead is grown as a safeguard against a hard winter and for late feeding in March and sometimes April. A hardier marrowstem variety could replace thousandhead for January and February grazing. Work at this Institute has shown that marrowstem lines with better winter hardiness can be selected, and that a few of these have stems which are not very woody. Winter hardiness in the stem is partly correlated with high dry matter content of the stem pith. Since in many root crops, varieties with the highest dry matter percentages do not give the highest yields per acre, it is unlikely that a winter-hardy marrowstem would yield more than present varieties.

Medium-height types

Some farmers suggest that in future kale will be cut mechanically, and fed to the cattle in the stockyard. Such management would not need really short-stemmed types of kales; consequently, breeding work has been started to develop a variety which would have a height of about 4½ feet. Selection in this medium-height variety is for the same characters as in the short-stemmed type—minimum woodiness of thick stems, greater resistance to lodging, maximum leafiness and good leaf retention, with some improvement in winter hardiness. Using the double-cross hybrid method, it should be possible to improve on the yields of present commercial stocks of marrowstem.

Thousandhead kale

Uniformity, winter hardiness and yield of leaf and stem can probably be

improved in thousandhead by selection, inbreeding and the use of the double-cross method. Breeding work at Cambridge is at present confined to the production of a uniform stock of a leafy short-stemmed type, which branches freely from ground level and is winter hardy and late flowering. This variety would be useful for grazing in March and April until new grass is available. Although it is very unlikely that marrowstem can be bred to equal thousandhead for winter hardiness in the near future, the best long-term method for improving late winter grazing may be based on the transfer of desirable characteristics from thousandhead and other hardy kales to marrowstem.

References

1. Self-incompatibility in Marrowstem Kale, *Brassica oleracea* var. *acephala*. I. Demonstration of a Sporophytic System. K. F. THOMPSON. *J. Genet.*, 1957, **55**, 45–60.
2. Self-incompatibility in Marrowstem Kale, *Brassica oleracea* var. *acephala*. II. Recognition of Plants Homozygous for *S* alleles. K. F. THOMPSON and H. W. HOWARD. *J. Genet.*, 1958 (in the press).
3. The Yield and Composition of Kale and Cabbage with and without Nitrogenous Top Dressing. M. E. CASTLE, A. S. FOOT, ZENA D. HOSKINGS and S. J. ROWLAND. *J. agric. Sci.*, 1957, **48**, 305–14.
4. Kale in Dorset. R. GARSIDE and A. H. R. LILLY. *Agriculture*, 1958, **65**, 16–20.
5. Silage in the Economy of the Farm. H. T. WILLIAMS. *Agriculture*, 1956, **63**, 1–5.
6. Close Folding of Dairy Cattle with the Electric Fence. M. E. CASTLE and A. S. FOOT. *Agriculture*, 1949, **56**, 1–6.

Siting Silos

R. W. PATRICK, B.SC., DIP. FARM MANAGEMENT (LEEDS)

Seale-Hayne Agricultural College, Newton Abbot

It pays to plan the site of your silos. Long hauls can waste time and reduce efficiency.

ONE of the more important aspects of making silage is the demand which it places upon farm labour, and just at a time when other jobs like cultivating, fertilizing, root hoeing, haymaking, and even harvesting, have to be done. It is of considerable help, therefore, if silos can be sited as near as possible to the field or fields of crops concerned.

For a farm of average size with buildings centrally situated, it is best to buckrake the crop to a silo near the buildings. But where, as in many cases, farms are either irregular in shape or the buildings are all together at one end, it would be better to build the silo as near as possible to the silage crops and cart the silage to stock daily during winter. This means, of course, that there must be reasonable access to the silo.

Saving time

On one farm (call it Farm A) which we looked at, there is an average haul of half a mile from fields to silo and buildings. In winter, silage is carted by

tractor and trailer 50 yards to the stock building every day. The distance is not very important; what is significant is that a tractor and trailer have to be used. This happens on many farms today. On another farm (call it Farm B) the silos have been made at selected sites so that the average travelling distance from field to silo has been reduced to about 400 yards, and in winter silage has to be carted over a distance of 500 yards.

On the first farm, buckraking with two medium-heavy tractors and one man on the silo allows 100 tons of settled silage to be made in 99 man-hours. With light tractors, the time would be 173 man-hours. On Farm B, with the same organization, the times would be roughly 60 and 110 man-hours respectively.

For a full comparison, the effect on winter labour requirements must also be considered. Farm B has to cart its silage an extra 500 yards, which takes one man about five minutes more each day: cutting and loading times remain the same. If silage is fed over a period of 200 days, Farm B would use 17½ man-hours more labour in winter than would Farm A.

The net effect of these savings clearly favours the system of Farm B, both from overall demand on labour and reduction in work involved at silage-making time.

Buckraking instead of green-crop loading

Records which I have made in past seasons* show that even over considerable distances buckraking is more efficient than either green-crop loading or baling methods. These results, summarized in the table, suggest that farmers with existing silage equipment should consider taking advantage of grants not only to extend their silage-making but also to put up more conveniently situated silos and so improve efficiency.

Distances at which green-crop loading of grass becomes a superior method to buckraking, in terms of output per hour and cost per ton of grass handled

	In terms of output per hour No. of trailers operated			In terms of cost per ton No. of trailers operated		
	1	2	3	1	2	3
	yds	*yds*	*yds*	*yds*	*yds*	*yds*
1 light tractor	320	—	—	590	630	880
2 „ tractors	1,200	390	390	740	750	1,040
3 „ „	—	740	740	740	760	1,090
1 medium-heavy tractor	1,060	360	360	1,540	1,540	1,790
2 „ „ tractors	—	1,060	1,000	—	—	—
3 „ „ „	—	—	1,570	—	—	—

It may be profitable for farmers to change from green-crop loader to buckrake systems. Let us look at the following example. At present a farmer makes 100 tons of silage using two tractors, two trailers and a green-crop loader, which involves a team of four men. He aims at making 200 tons of silage and plans to build a new silo under the Silo Subsidies Scheme. The existing silo is at the buildings, and involves an average haul from the fields of about 800 yards. Should he site the new silo at the buildings or in the

* Comparative Cost of Carting Silage. R. W. Patrick. *Power Farmer*, 1956, 373–5.

fields? If it is properly placed, 100 tons of silage can be made from fields surrounding it and another 100 tons from fields near the buildings. The average travelling distance can be halved.

What economies will the new system produce? For distances under half a mile, the factor limiting the rate of green-crop loading is not the distance from field to silo, but the rate at which the man loading can handle grass. At short distances it is common to see a tractor and trailer in the field waiting for the other trailer to be completely loaded. In consequence, to cut down the average carting distance does little to increase the efficiency of the green-crop loader method. To gain the full effect of a change in system, a change of equipment is necessary; for instance, selling the green-crop loader and buying two buckrakes. Using the green-crop loader on this farm, 304 man-hours would be required to cart grass to make 200 tons of settled silage, whereas 121 and 221 man-hours would be needed for buckraking with medium-heavy and light tractors respectively. Buckraking with medium-heavy tractors would save £31 or £43, depending whether the saving was at ordinary or overtime rates. Corresponding figures for buckraking with light tractors are £13 and £19 respectively.

By adopting these principles, many farmers could either reduce the cost of silage-making or make more silage with their existing labour, without coming up against any difficulties in organization.

More silage with less labour

Thus siting the silo near the fields from which the crop is to be obtained, and reserving the long hauls for winter, has much to commend it to farmers thinking of making silage for the first time. For farmers already making silage, the principle may also have something to offer. It is impossible to generalize, as each farm has its own conditions and must be considered individually. On many farms the determining factor may be the availability of suitable roadways and access to field silos in winter.

In practice, the above principles have been incorporated in expansions brought about by intensifying the grassland management on the Seale-Hayne College farm in recent years. Since the initial introduction of grass silos at the homestead some years ago, silos have been built at selected sites throughout the farm, with the object of obtaining the economies possible with buckraking. In the last three years the green-crop loader has been used less and less, but greater quantities of silage have been made by a smaller labour force.

Hop Research at Wye College

H. S. DARLING, B.SC., M.AGR.

Progressive wilt, soil structure and machine picking are among the problems being investigated by the Department of Hop Research at Wye.

ALTHOUGH the acreage of hops in England is small—something over 21,000 acres—its annual value is impressively high: in 1957 the harvest of 13,400 tons of dried hops was valued at more than £6½ million, an average gross return of £300 per acre. Under favourable circumstances gross returns of more than £800 per acre may be obtained.

This high average return per acre, coupled with the fact that the quota system of marketing limits hop production, provides an obvious reason for the local respect and interest enjoyed by this relatively minor crop. An equally valid reason is that hop growing is, by any agricultural standards, a skilled industry; specialized knowledge and equipment are required at all stages of the production of the crop.* The present system of marketing sets a premium on quality and ensures that the successful grower will gain an adequate return for the care, skill and expense which he invests annually in his hops. It must also be appreciated, however, that a single major mistake in the management of this tricky and costly crop may result in a growth of poor quality which will have to be sold to maintain quota and yet will be a loss to its grower.

The Department of Hop Research at Wye, which was set up in 1947 under Dr. A. H. Burgess and receives guidance in its work from the Agricultural Research Council, has a staff of only nine to meet the research needs of the hop industry. This is a large task for a small team. They work in a new laboratory block, completed in 1953, which has its own glasshouses and a battery of electrically-operated miniature kilns for investigations on hop drying, its own hop gardens on the College farm, and a modern oast designed to dry the produce of experimental plots. In 1958 a picking machine was installed to supplement the steadily declining force of hand pickers and to give experience in mechanical harvesting.

Among the problems at present facing English hop growers, there are six of major importance. Three of these involve the diseases progressive *Verticillium* wilt, nettlehead virus and downy mildew. The others are the maintenance of soil fertility in hop gardens, the mechanization of hop picking and the understanding and management of hop growth.

Breeding for wilt-tolerance

The potential research load on the Department is lightened by the fact that East Malling Research Station is responsible for work on hop virus diseases and progressive *Verticillium* wilt. Progressive wilt is a lethal, soil-

* For a general account of the technical aspects of present-day hop production in England, reference should be made to *Hop Growing and Drying* (Bulletin No. 164 of the Ministry of Agriculture, Fisheries and Food) and also to *The Hop Industry*, a productivity report published in 1951 by the Anglo-American Council of Productivity.

borne disease for which no control measures are yet known, other than the destruction of infected plants and thorough garden hygiene. It is almost entirely confined to the south-eastern region, where it was first recorded in 1933, and it is now common in the Weald of Kent. In spite of strictly enforced legislation to prevent the movement of infective material, the disease is spreading slowly. Hop growers are understandably alarmed: this is a matter of crucial importance to the industry as a whole.

While research at Wye is not concerned with the wilt fungus as such, the plant breeders in the Department are contributing largely to what appears, at present, to be the most satisfactory answer to the problem—the production of varieties with a measure of field resistance to the disease. Such varieties, which are called "wilt-tolerant", can survive in infected soil and produce an economic return in spite of the activity of the fungus in their root system. By contrast, "sensitive" varieties, which include most of the commercial varieties of today, are quickly killed. Every effort is being made to produce tolerant varieties which are as acceptable commercially as the sensitive varieties they are intended to replace. A series of tolerant seedlings, bred jointly by Wye and East Malling in 1950 to replace the popular but wilt-sensitive Fuggle, have been comprehensively tested and stocks are now being built up at Wye for large-scale garden and brewing trials, due to begin in 1960. Current plant breeding research at Wye makes extensive use of colchicine-induced polyploidy to facilitate the combination of desirable brewing quality with wilt-tolerance. Such breeding has given a range of triploid seedlings from Golding and Fuggle parents, and also from the Wye variety Bullion. Preliminary results of this work are encouraging, and promising seedlings are coming forward for wilt-testing at East Malling.

Downy mildew

Downy mildew of hops appeared in England in 1920 and spread rapidly, causing serious losses. By 1930, investigation at Wye established that the disease could be controlled to a greater or lesser extent by the removal of diseased plant tissue and the thorough application of copper fungicides. Little further research was carried out at that time and spiking, stripping and coppering have since remained as routine but costly operations in the hop growers' calendar.

This early research on downy mildew left important gaps in our knowledge of the disease. For example, it failed to show how infection survived over the winter to appear in new shoots in the spring. It also failed to assess the importance and status of rootstock infection, and it did not establish the extent to which the fungus can persist and spread systemically in the aerial parts of the plant. Research on this major disease of hops began again at Wye in 1955, to find out more about its biology and annual cycle. To have supplies of inoculum for research at all times of the year, hop plants have to be kept growing under glass during the winter, using artificial light and heat, because the fungus is an obligate parasite which multiplies only in living hop tissue.

Ways have had to be found of measuring how susceptible different varieties are to downy mildew. This work is being undertaken to help the plant breeders in current research at Wye on the production of resistant varieties.

Soil structure

The maintenance of soil fertility in hop-gardens is of prime importance. A striking feature of the crop is the speed of its growth and development during the summer months. Such growth demands a deep, rich soil of good structure: hops generally get the best land available on any farm on which they are grown.

The problem of soil structure becomes obvious when it is realized that the crop is grown under continuous arable conditions on the same land for many years, and that each season the soil is subjected to much mechanical action in the course of routine ploughing, cultivating, spraying and harvesting operations. Traditionally, soil structure is maintained by frequent heavy applications of bulky organic manures such as dung and shoddy. These are no longer as cheap and easy to obtain as they were, and other ways of improving crumb structure are being explored. Grassing down, which has been so beneficial in fruit orchards, has been attempted in recent years under guidance from Wye, and has given mixed results. Hops will grow satisfactorily in grass, but competition between the sward and the crop for nitrogen and soil water, and the necessity for frequent close mowing, have posed questions we cannot answer yet. Further research is necessary.

Some growers go to extravagant lengths to feed their hops with exotic and expensive organic fertilizers of small bulk and relatively low manurial value. Unnecessarily large dressings of phosphatic compounds are also commonly applied. The Department has worked out and uses a balanced manurial programme which is relatively cheap, and has given good results at Wye over a number of years. It has been adopted with success by a number of progressive growers. The whole question is being examined in detail by a series of manurial trials on different soil types in Kent and East Sussex. The results should provide a wide and sound basis for future recommendations.

Machine picking

Since the second world war, economic and social changes have progressively reduced the supply of hand pickers, and forced many growers to buy and use picking machines. In 1958 well over half of the crop was so picked, and the proportion will almost certainly increase still further in the next few years. This development has given rise to many problems for hop growers: the type of crop which is suitable for picking by hand may give poor results when picked by machine. Choice of variety, height of wirework, width of spacing, vigour of growth and its general management are among the more important factors involved, and research at Wye is much concerned with their assessment in relation to the problem as a whole.

It has been found that many of the Wye varieties, bred by Professor Salmon, pick better on the machine than the native English kinds. This is mainly due to the firmness and density of their cones, which resist the undesirable shattering action inherent in all picking mechanisms, and separate readily from leaf and stem in the cleaning process. These desirable qualities may be enhanced in the triploid varieties now being bred at Wye, the cones

of which are relatively seedless. Seedless cones have been found to resist shattering more than seeded cones, and it is hoped that triploid hops will be specially suitable for mechanical picking.

The effect of varying the height of wirework and the width of spacing has been studied in an elaborate trial at Wye, using four varieties, three heights of growth and three widths of plant. This has recently ended and is being replaced by a second trial based on the findings of the first, with certain modifications. The results already obtained emphasize that greater height appears to produce the type of growth required for the machine, whereas wider spacing reduces yields per acre.

Growth studies

The control and management of hop growth is a problem of the greatest interest to the grower, apart altogether from its significance in connection with mechanical picking. The hop plant renews its herbaceous structure above ground annually, with a speed which is perhaps the most striking feature of the crop. In spite of this, little scientific information exists on many aspects of hop growth and development in this country. Many growers try to manage the growth of their crop in the light of observations made over the years under the conditions obtaining on their own farms. Such experience is inevitably local in character and value, and a grower would be rash to claim that he understood the principles underlying the observations he has made. Such understanding is more likely to result from scientific growth studies made on the crop by a worker trained in this fascinating but much neglected subject.

Growth studies on hops have just begun at Wye. It is inevitably long-term work, and results will not be forthcoming immediately. The pattern of development of the hop is shaped by the seasonal sequence of phases of vegetative growth, reproduction and dormancy. These phases are presumably associated with the ebb and flow of carbohydrate food reserves in the rootstock, representing a fundamental rhythm of basic importance in the production of the crop. Superimposed on this basic rhythm are the variables introduced by the grower, such as choice of variety, selection of primary growth in the spring according to vigour and appearance, severity of leaf stripping and shoot pruning to control disease, height of wirework, slope of stringing, the time of cutting or otherwise of bines for machine picking, and the time of rootstock pruning in the winter or spring. The study of these factors, not to mention the fashionable topic of irrigation, provides a field of research which is so large that its very size is a hazard. The crop physiologist must work carefully or he will lose his bearings and his work will become disconnected.

No account of hop research at Wye can ignore the subjects of picking machine performance and hop drying. In the past the researches of departmental staff have contributed much in both these fields of work, but further advances in the design of picking and drying equipment will depend on research by suitably trained agricultural engineers. With this in view the Department has arranged for the National Institute of Agricultural Engineering to take responsibility for research on these problems. This co-operation is already bearing fruit, and in 1957 and 1958 N.I.A.E. staff have used

departmental equipment for research on factors peculiar to hop driers of advanced design.

Other current research of importance in the Department includes investigations on the use of systemic insecticides to control hop pests, the evaluation of spray deposits by micro-chemical techniques, studies of the organic chemistry of the hop plant with special reference to resin formation, and the role of boron in the mineral nutrition of the crop. Work is also being undertaken on breeding hops suitable for brewing lager beer.

Looking to the future

The future work of the Department may be concerned increasingly with problems of fundamental as well as applied importance. The need for applied research will by no means be neglected, but where necessary the Department must itself obtain the fundamental data on which its applied research is to be based. The success of hop research at Wye will depend largely on striking the balance between these two.

The Pros and Cons of Irrigation

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Irrigation offers undoubted advantages, but setting up an installation needs careful consideration.

SIXTEEN inches of rain fell at Wellesbourne during the 1958 growing season—four inches more than the average—and naturally no one would expect increased yields from irrigation under those conditions. Nevertheless irrigation would have helped the germination of seed and the establishment of young plants, for at the end of April and May the moisture deficit under bare soil was recorded as being 1–1½ inches. On a medium loam most of the water available to plants in the top foot of soil had been lost.

Thus the advantage to be gained from irrigating in any particular year depends at least as much on the distribution of rainfall as on its total amount. The success of irrigation is usually judged on the increase in crop yield obtained. But the use of irrigation to enable seedbeds to be prepared, to secure prompt and even germination of seed, or to help establish a transplanted crop, may save time or result in an earlier harvest—factors which are difficult to assess in terms of cash. Indeed, the use of irrigation for purposes such as these may turn a potential crop failure into a marketable harvest.

There can be little doubt that in most years many crops will yield more after suitable irrigation. As with all cultural operations, however, it is necessary to compare the cost of irrigation with the value of the increase in marketable crop.

Water supply and pumping costs

Estimates of the cost of irrigation vary from £1 to £10 per acre-inch of

water applied, according to circumstances. The most expensive source of water is the public supply, and this has the further disadvantage that in time of drought, many authorities are forced to supply water for domestic purposes before meeting irrigation needs. The cheapest source of water is a river, stream, spring or pond; where even a small one exists on the property, it is worth investigating whether it can be made to supply enough for the desired irrigation; for example, by impounding or by the collection of winter surface drainage. The amount required will vary according to the crops, soil and weather, but there must be at least enough to apply several inches to the projected irrigation area during the summer. The legal rights of downstream riparian owners must, of course, be respected in any such scheme. The cost of surface wells, reservoirs and boreholes is usually intermediate between these two extremes.

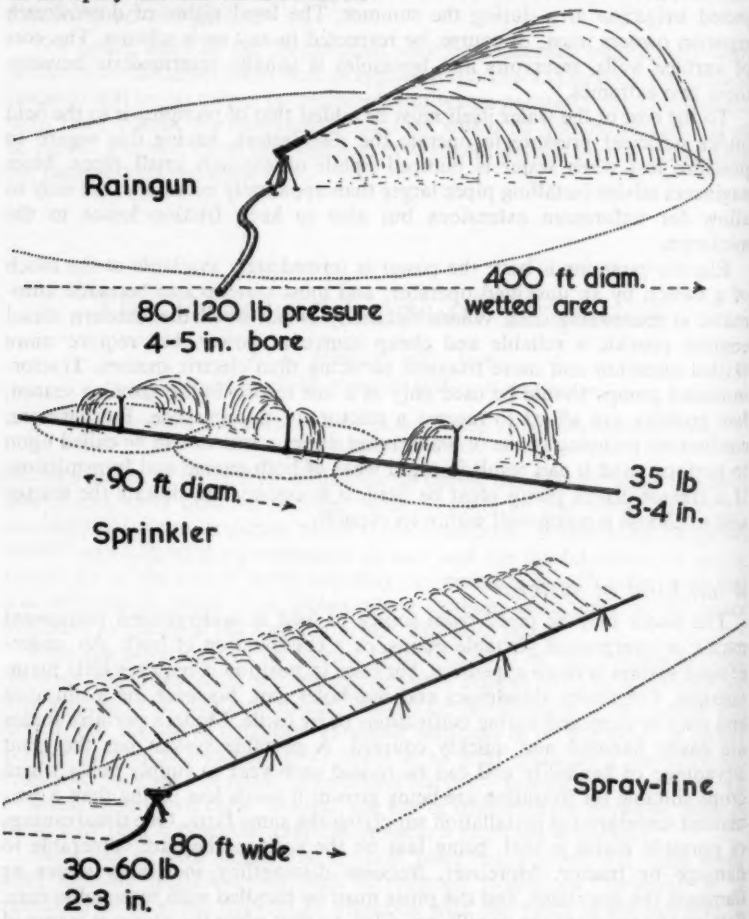
To the cost of the water itself must be added that of pumping it to the field under sufficient pressure to operate the distributors, having due regard to pressure lost when water is pumped uphill or through small pipes. Most engineers advise installing pipes larger than apparently necessary, not only to allow for unforeseen extensions but also to keep friction losses to the minimum.

Electric pumping is best; the power is immediately available at the touch of a switch by an unskilled operator, and most systems can be made automatic at reasonable cost. Where electricity is not available, modern diesel engines provide a reliable and cheap source of power, but require more skilled attention and more frequent servicing than electric motors. Tractor-mounted pumps should be used only as a last resort; in the growing season, few growers can afford to reserve a tractor for this purpose. Furthermore, continuous pumping is one of the heaviest duties a tractor can be called upon to perform, and it can result in rapid wear of both engine and transmission. If a tractor-driven pump must be used, it is essential to de-rate the tractor and to choose a pump well within its capacity.

What kind of system?

The water may be piped from source to field in underground permanent mains or overground portable mains, or a combination of both. An underground system is more expensive, but once in position it requires little maintenance. Permanent standpipes and manholes can, however, be a nuisance and may be damaged during cultivations or by cattle. Modern portable mains are easily handled and quickly coupled. A portable system has the great advantage of flexibility and can be re-laid each year to supply fields where crops suitable for irrigation are being grown: it needs less piping than a permanent underground installation supplying the same farm. One disadvantage of portable mains is that, being laid on the surface, they are vulnerable to damage by tractor. Moreover, frequent dismantling inevitably wears or damages the couplings, and the pipes must be handled with reasonable care. Self-emptying joints are usually provided, so that when the pressure is turned off the pipes are automatically emptied, ready for removal. A pool of water forms at each joint, but this disadvantage has been partly overcome by a design which permits only comparatively slow leakage, so that the water has time to drain away through the soil.

The type of distributor used to apply the water to the land affects the cost of application. Rainguns, some of which can irrigate an acre of land from one point, require least shifting from site to site, but their weight, the size of the necessary supply pipes and the high pressure required make the cost of applying water almost as much as with sprinklers or spray-lines, which need more frequent moving. Old-type spray-lines are usually supported on tripods, which have to be rearranged individually at each shift of the line. The cost of this operation is reduced in newer designs in which the tripods are hooked on the spray-line and carried with it.



In general, the bigger the area covered by the distributor the larger are the drops of water reaching the soil, and the less even is the pattern of distribution. Large drops falling on bare soil damage the tilth, and in a recent experiment the yield of lettuce was reduced by watering with large drops, as

compared with applying the same quantity of water as mist. However, the use of very small droplets is at present impracticable in the field because wind blows away much of the fine spray.

The effect of droplet size is apparently of less importance with robust crops which cover the ground and, therefore, protect the soil with their foliage. The raingun is satisfactory for farm crops such as grass, sugar beet or kale. But for market-garden crops, most of which cover the soil completely for only a small part of their life, sprinklers or spray-lines must be used, and there is little to choose between the latest designs in their effect on the soil and their evenness of water distribution.

Much research has been done to determine the best soil moisture conditions for growth throughout the life of various crops, and it is often assumed that the irrigator should try to regulate the soil moisture for each of his crops during its whole life. On a mixed holding, where there is only a limited amount of equipment and water, this is manifestly impossible. Some growers have therefore adopted one of two expedients. In the first of these, irrigation is concentrated on a single high-value crop, while all the other crops are left to be watered by natural rainfall; in the second, the equipment is moved systematically round a series of fields so that each crop is watered at regular intervals, with little or no regard to the weather. Recently, however, more attention has been paid to the determination of stages in the growth of crops during which they are especially sensitive to variations in soil moisture. For example, it has been found that heavy watering of peas during early life resulted in the production of luxuriant haulm, but little increase in yield of marketable pods. On the other hand, abundant watering immediately after the flowers turned white caused a considerable increase in crop. When similar information is available for other crops, it will be possible to use water and equipment to the best advantage.

Where and how much water?

The most difficult problem confronting the irrigator concerns the amount of water to apply and when to apply it. Water can be applied little and often, or in larger quantities at longer intervals. The first of these systems is the more costly in labour, but has the advantage that the crops are kept more or less continuously well supplied with water. But although many crops, especially those whose foliage is the marketed produce, yield most under continuously wet conditions, such treatment may not give the highest cash profit in relation to costs. In an experiment with self-blanching celery, for example, the most profitable treatment judged on this basis, was to restore the soil to field capacity at planting time, and then to give no more irrigation. The total harvest was smaller than with frequent irrigation, but it cost much less to produce. On the other hand, irrigation has been shown to affect the quality of produce, and where high quality produce is required, an expensive treatment may be necessary.

The effect of irrigation on quality has not yet been thoroughly investigated; it may be harmful or beneficial. Frequent irrigation has been shown to reduce the flavour of tomatoes, but to render turnips less "hot" and less stringy. Irrigated produce often looks plumper and more succulent than non-irrigated produce, but another aspect which requires investigation is the effect on the

keeping quality of such produce, especially after it has been through a vegetable washing machine.

Estimating the need

Whether a crop is irrigated throughout its life or only during a particular stage of growth, the amount of each application of water depends upon the previous weather. This is because the loss of water from the soil by evaporation, and by transpiration through the plants, is controlled by the weather. Penman has devised a method in which measurements of temperature, humidity, sunshine and wind are combined to estimate the amount of water which would have evaporated from an open water surface during the period under examination. From this, it is possible to estimate the loss of water from crops. Other workers have modified the method so that it is applicable to crops which do not fully cover the ground or are not fully supplied with water; an estimate using a simplified version of the formula is published regularly by the N.A.A.S.

Such figures enable a grower to determine how much water has been taken from his soil, and therefore how much irrigation plus rainfall will be needed at any time to restore his soil to field capacity (the state when it is holding its maximum amount of water against free drainage). The Penman estimate is a running total of soil moisture deficit. The grower is left to decide, from experience or experiments and with due regard to his soil type, at what deficits each of his crops must be watered, or what deficit must not be exceeded while the crops are in certain stages of growth.

From time to time, instruments have been developed to measure the moisture content of the soil for use in controlling irrigation. Such instruments include electrical resistance and capacitance blocks, and tensiometers. These have been sold for commercial use in America and elsewhere, but experiments at various centres in this country have shown that there is no instrument yet available here which can be recommended unreservedly for use by commercial growers. All are probably best regarded as scientific tools for use by research workers rather than by growers.

In default of a satisfactory soil moisture meter, instruments have been devised to measure the evaporating power of the atmosphere, which is the factor estimated in the Penman calculation. One such instrument will shortly be available commercially; the results of trials suggest that it may eliminate the need for calculations according to the Penman formula on commercial holdings.

Much more is known of the mechanical aspects of applying the water to the land than of the effects of the water on the crops themselves. Hence, a competent engineer can plan a satisfactory installation to meet most local conditions, but sound advice about the amount and timing of the actual irrigation is more difficult to obtain.

Present advice

In the meantime, what is the grower to do? With a few crops, such as peas and turnips, some information has been obtained on water-sensitive periods, and irrigation may be confined to preventing a deficiency of more than one

inch at these times. With foliage crops such as grass and cabbage, an attempt should be made to prevent the accumulation of a substantial deficit at any time. With other crops, the soundest policy, in the absence of detailed information, would seem to be to ensure that the soil moisture content is near to field capacity at sowing or planting time and, in a dry growing season, to restore it to field capacity about halfway through the life of the crop. It must be emphasized that these suggestions are tentative, and may need revision in the light of future experiments.

The planning and operation of an irrigation installation to the best advantage is a complicated matter. The capital cost of the equipment is considerable, but it can be reduced to a minimum by planning the irrigation on the lines indicated above. Similarly, the running costs and labour charges are affected by the system of watering adopted. The cheapest method may not result in the highest yields or top quality produce, but it may give more profit per pound spent than more expensive watering which is likely to result in heavier crops. Amid all these complications, one encouraging note may be sounded. Irrigation equipment is almost impossible to find on the second-hand market; farmers and growers, once they have tried irrigation, rarely give it up, and this is surely worth remembering, even after such a wet summer as last year's.

British Weed Control Conference

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The progress made by chemical research in the field of weed control during the past ten years has been phenomenal. The fourth British Weed Control Conference, held at Brighton on 4–6th November 1958, revealed both further advances and problems still to be solved.

THE fourth British Weed Control Conference was held at Brighton on 4–6th November, 1958. No outstanding new weed-killer was announced this time, but a new chemical—diquat—appears likely to be useful, mainly for potato haulm destruction, desiccation of clover seed crops and non-selective weed-killing. Further research is needed before its full potentialities can be defined.

Great interest was aroused by the new cultural techniques which may be possible as a result of using weed-killers before reseeding old pastures. Such progress is more likely to come from official than commercial research, since the latter is primarily concerned with developing herbicides for use in the existing pattern of agriculture. As if to illustrate this, the three research reports presented on reseeding old pastures were by official workers.

Use and effects of dalapon

Interest in the subject has been revived by the recent introduction into this country of the grass-killer dalapon. Unlike trichloracetic acid, which enters

through a plant's roots, dalapon is taken up mainly through the leaves, and its action is less influenced by soil type and cultivations. With 2,4-D to kill the broad-leaved weeds, it has been used to kill swards in areas difficult or impossible to plough. In smaller doses it will check the growth of old swards while ryegrass and clover, seeded into the sod, establish themselves. Information is accumulating on the susceptibility of various species of grass to dalapon, from which it will eventually be possible to advise on the most suitable dose to kill any particular sward. Meanwhile, the evidence points to a dose of 10 or 20 lb being generally necessary to give a near-complete kill; any broad-leaved weeds present have to be controlled, otherwise they quickly dominate the area once the grass has been killed off. Spraying has been carried out in the autumn followed by spring reseeding, and in the spring immediately followed by reseeding during the same season. The time to spray dalapon, however, is not necessarily the best time for 2,4-D, so it may be better to apply the two chemicals at separate times. It appears from preliminary work that a dose of 20 lb dalapon probably does not persist for more than about two months. The most intractable problem is that of preparing favourable conditions for the newly-sown seed once the sward has been destroyed. It is not clear what the most suitable cultivations are under any particular circumstances.

As regards the effects of dalapon on couch and water grass, doses of up to 20 lb per acre can usefully reduce an infestation, but will not necessarily kill it out. The chemical appears to induce a dormancy in the couch rhizomes which may, under certain conditions, lead to death; hence the importance of cultivations and cropping after spraying. A similar picture emerged of the effects of dalapon on bracken.

Grassland productivity after spraying

Another aspect of grassland considered was that of productivity following spraying. It may seem self-evident that removing dense stands of weeds by spraying will increase productivity, but it must be remembered that MCPA and 2,4-D can harm clover in the sward, and this may reduce productivity. There is remarkably little published evidence on the problem, but three research reports at the Conference made some contribution to it. Although spraying reduces infestations of creeping buttercup and creeping thistle under conditions where the grass is cut twice a year, the total production of green matter is not, seemingly, reduced; the grass presumably increases to make up for the reduction in weed. A similar result has been obtained on a grazed sward sprayed with MCPA against, principally, creeping buttercup. The use of nitrogen on the unsprayed sward leads, as might be expected, to appreciable increases in yields of grass; but the use of nitrogen on the sprayed sward encourages even greater increases. It appears that if the best results are to be obtained from the chemical control of weeds, the initial spraying must be followed by adequate manuring. Moreover, the full benefit of nitrogen is not obtained where there are many weeds in the sward. An increasing control of creeping buttercup leads to more intensive grazing of the sward by cattle.

Trials were reported which show that the sodium salt and the butyl ester of 2,4-DB may be applied safely to seedling lucerne at any time between the first true-leaf stage and the fourth trifoliate leaf stage. On established weed-

free lucerne crops, 2,4-DB may reduce yield, but it was suggested that such reduction may be offset by the gain resulting from the control of weeds.

Susceptibility of cereals to herbicides

One of the factors considered by the National Institute of Agricultural Botany when assessing the value of new cereal varieties is their susceptibility to weed-killers. Different varieties of spring wheat, oats and barley may not react in the same way to MCPA and 2,4-D. In experiments to show up the differences, spraying was carried out at a time not normally recommended. There was nothing to suggest any danger from spraying the present commonly grown varieties in the correct manner. It is good to know that any new variety showing marked susceptibility will be detected by the N.I.A.B. before it is likely to be recommended. Differences in varietal susceptibility were also shown in work with mecoprop (formerly known as CMPP) on spring wheat. It was said that spring oats and barley may safely be sprayed with mecoprop from the one or two-leaf to the jointing stage. With spring wheat, however, it seems safe to spray Koga II at the same range of growth-stage as spring barley and oats, but Atle and Atson were damaged when sprayed before the five-leaf stage.

Further information on weed control by mecoprop confirms its particular value against cleavers and chickweed, and indicates also that it can usefully control the campions and scentless mayweed if applied during the early stages of the plant's development. Other work on cereals has shown the value of sodium monochloracetate for controlling redshank and black bindweed. Trials were described in which all cereal crops except spring wheat were unaffected when sprayed with 2,3,6-TBA/MCPA between tillering and the beginning of the jointing stage; more work appears to be necessary to clarify the position of spring wheat. The susceptible weeds of particular interest include cleavers, chickweed, redshank, mayweeds and viper's bugloss.

Wild oats

Further work with trichloracetic acid and propham applied to the soil to control wild oats before sowing sugar beet and peas has shown that trichloracetic acid seems to be safer than propham on sugar beet. Both, however, are safe for use on peas. Propham does not cause the change of leaf surface in peas (which makes the crop more sensitive to dinoseb sprays) associated with trichloracetic acid. It also has the advantage of controlling some broad-leaved weeds, notably chickweed and knotgrass, which are not affected by trichloracetic acid. The best results are obtained with trichloracetic acid when applied 2–3 weeks before sowing the crop; with propham, they follow applications made immediately before sowing. This is important in relation to loss of soil moisture and earliness of sowing.

With the advent of herbicides, the pea crop no longer presents the weed problem it once did. It is its relation the field bean that is now getting attention. Doses of ½–2 lb per acre of the soil-acting herbicide simazin have been used successfully to control many annual weeds on an Oxford clay soil, applied either before sowing the beans or after sowing but before the crop emerges. On sandy soils doses of 1 lb or more of simazin have caused some

damage to the crop. More work is necessary before general recommendations can be made.

Sulphuric acid is still the most generally effective weed-killer in kale, and it is the only one used with a high degree of success against fat-hen. Potassium cyanate and sodium monochloracetate are generally effective against redshank and yellow charlock if applied early, but almost valueless against fat-hen. Both are less consistently effective than acid. The herbicidal property of gas liquor has also been investigated.

Other interesting reports

This brief and incomplete survey of the three-day Brighton Conference necessarily omits much of interest. Other reports at the Conference dealt with weed control in sugar beet with pre-emergence sprays, herbicides in horticulture, aerial spraying, non-selective weed control, weed control in water, and so on. Justice cannot be done here to Dr. E. K. Woodford's invaluable paper, *A Survey of International Progress in Chemical Weed Control*. Some of the interesting points he touched upon were the lack of facilities for training in herbicide technology; the need for impartial advice and the training of specialist advisory workers; the closer control of marketing and use of herbicides, particularly of poisonous chemicals and in the use of aircraft for spraying; and the desirability of a survey of herbicide usage. Nor is it possible to do more than mention the remarkable synopsis *Herbicides and the American Farmer*, by Dr. R. H. Beatty of the Weed Society of America. The Proceedings of the Conference will enable those who are interested to read the wealth of information in these papers and reports: they will be obtainable in about six months' time from the Society of Chemical Industry and the British Weed Control Council, 14 Belgrave Square, London, W.1.

Film on Foot Rot

A short colour-film (12 minutes' running time), *The Control of Foot Rot in Sheep*, has been made by the Universities Federation for Animal Welfare with the technical assistance of Evans Medical Supplies Ltd. It emphasizes the solemn responsibility that farmers have to take positive and early action against this painful disease which causes high economic loss every year. This is a film which every flock-master and shepherd will be glad to see. It can be borrowed free from UFAW, 7a Lamb's Conduit Passage, London, W.C.1.

Manx Seed Potato Production

G. WYLLIE HOWIE, B.SC.

Isle of Man Board of Agriculture and Fisheries Experimental Farm

Manx seed potatoes can hold their own in the highest company, and are helping to reduce the Island's dependence on the tourist trade.

To be wholly dependent on a tourist industry is like having all your eggs in one basket. This is largely the position in the Isle of Man. A succession of good seasons often induces a sense of security which subsequent years may prove to have been hollow; and good holiday seasons, like the weather, tend to run in cycles. In any year, there may be abundant and well-paid work for a few weeks or months, but what of the greater part of the year?

The position is illustrated to some extent by comparing the Potato Marketing Association's returns of sales of first and second earlies during June, July and August with the increase or decrease in the season's passenger returns.

	Sales *tons*	Passenger returns compared with 1954
1954	1,585	—
1955	1,309	+65,545
1956	1,512	+23,322
1957	1,284	−12,428
1958	1,220	−71,528

In encouraging the production of potatoes for seed, one of the Board of Agriculture's main objects is to reduce farmers' dependence on summer sales. And from the time lifting begins until the seed is delivered to the buyer months later, there are possibilities of employment for those men and women (particularly in the villages and near the smaller towns) who are generally classed as "season" workers.

Two markets

The seed potato grower has two possible markets. There is the local demand. Quite a number of growers cater for it already, but the possibilities remaining are quite clearly shown by the average quantities of seed imported during the past three years—81 tons of first earlies, 17 tons of second earlies and 55 tons of maincrop: 153 tons in all. The farmers and market gardeners who grow for the early market rarely save any seed, and are always buyers of new seed, either home-grown or imported.

Secondly, there is the considerable market in England and Wales. Manxmen can see the magnitude of the trade done by Scots and Northern Irish growers, and feel that Manx seed should be able to secure a share of the English and Welsh growers' orders. Serious attention to this outlet began in 1950–51, when 54 tons of Manx seed were exported; this had increased to 92 tons two years later and to 164 tons in 1955–56. There was a recession in 1956–57, when everyone had too much seed to sell, but a partial recovery was made in 1957–58.

Manx growers find the high freight charges on shipping merchandise to Liverpool a handicap. The remedy seems to be to offer such good produce that the stiff overheads are more than counterbalanced. The Board of Agriculture and Manx growers are tackling the problem from both the import and export ends. Seed cannot be imported except under licence, and nothing less than "A" certificate seed is allowed in. There is a further proviso in the relevant Order: potato root eelworm does not exist in the Island, and any seed imported must carry a certificate from the Ministry or Department of Agriculture of the country of origin that the crop from which it came was grown on land which had been tested officially and found to be free from that pest.

Export is also under licence. From the beginning, "H" certificate stocks were not eligible for licences. This particular certificate was abandoned after the 1956 season: Manx seed can now be nothing less than "A" stock. Incidentally, the inspection standards in the Island are the same as those in Scotland and Northern Ireland. Seed is exported under the "Manxmark" certification trade mark, and it must conform to prescribed standards of grading and packing. Compliance with these standards is ensured by pre-shipping inspections at the grower's farm by the Board of Agriculture's inspectors, who seal every bag in the consignment. There is no intermediary between the growers and the buyers in England or Wales. Seed is collected from the farm and loaded at the port of dispatch.

Stocks vigorous and clean

The Island is fortunate that the spread of virus diseases among potato crops is unusually slow, and many stocks keep their health and vigour for exceptionally long periods. The outstanding example is on a farm in the north of the Island, where a stock of King Edward VII was grown for twenty-one successive years. During all that time the crop never failed to reach "stock seed" standard. This is by no means the only example, although it certainly holds the record.

This feature of Manx potato cultivation attracted the interest of the Department of Agricultural Sciences at the University of Nottingham, and arrangements were made for a systematic survey of aphids on crops in different districts. The second year's work was completed only recently, and the report on it is not yet available, but Mr. J. Y. Ritchie, who has been responsible for planning and carrying out the project, has commented: "I conclude from the 1957 survey that potato-aphid populations in the Island are later and reach a lower peak than do those in the ware-growing areas in England". Certainly, the high proportion of crops awarded "stock seed" certificates (27 per cent in 1957, 39·7 in 1958) is evidence that the spread of virus diseases by aphids is a relatively minor problem. The survey will be continued over a period of years long enough to provide information from which some definite conclusions can be drawn.

The Welsh Half-Bred Ewe

W. M. R. Evans, M.Sc.

Director, Trawscoed Experimental Husbandry Farm

The Welsh Half-bred is not a new cross, but it has been greatly developed since the end of the second world war and has a bright future.

Of recent years a new name has appeared in the long list of British breeds and types of sheep. The Welsh Half-bred ewe is the progeny of a cross between a Border Leicester ram and a white or tan-faced Welsh Mountain ewe. There is nothing new in this cross. Border Leicester rams have been used in the Principality for fat lamb production since the turn of the century. Crosses between this breed and the native breed were frequently on offer at Mold and Oswestry markets in the early 'twenties, but it was not until the 'thirties that the potential of the females was appreciated. During this period efforts were made to interest Midland farmers in the ewe lambs. At the same time the Border Leicester also became popular in Monmouthshire, where it was used on the Nelson type of Welsh Mountain ewe with some success. As a result of this popularity, a limited number of ram breeding Border Leicester flocks were established in North and South Wales. Further development of the cross had to wait until the end of the second world war, when the extension of the national flock gave it an impetus.

Post-war development

Wilkinson[1] of Cambridge University showed in 1949 how lowland farmers in England could economically breed for themselves a first-class grassland ewe by buying cheaply small draft Welsh Mountain ewes and crossing them with Border Leicester rams. He showed that females from this cross gave a lamb crop in excess of 150 per cent, and when crossed with Suffolk rams produced lambs that made a liveweight gain of 0·63 lb per day from birth to slaughter.

Also at this time, on the suggestion of Sir James Scott Watson, this cross received a thorough testing at the Trawscoed Experimental Husbandry Farm.[2] It was evident that hybrid vigour was present in the cross to a high degree, inasmuch as the progeny seemed to possess all the good qualities of both the Border Leicester and Welsh Mountain breeds. In size the ewes, at 140 to 150 lb, are twice the size and weight of their dams. They inherit from the Border Leicester the white face and alert appearance in addition to a high degree of fecundity and early maturity. From the Welsh Mountain breed they inherit the well-developed foraging qualities and a capacity for heavy milk production. Probably the only bad feature passed on by the parents is the presence of white kemp in the fleece. Nevertheless, this is made good by the increased weight of fleece, which is around 6½ lb of washed wool, compared with 2½ lb from the Welsh Mountain ewe. In value it approaches the price obtained for the top quality "Pick" Welsh wool. The wanderlust feature of the Welsh Mountain ewe is fortunately lost in the mixing of the

genes, with the result that the Welsh Half-bred ewe has the well-behaved character that one expects from a first-class grassland ewe.

At Trawscoed we found that the well-developed milking capacity made these ewes an attractive proposition for early lamb production. When they were crossed with rams of breeds with a capacity for quick growth, such as the Suffolk, we were able to exploit the milking capacity fully. Over a number of years liveweight gains of 0·89 lb per day have been obtained with lambs of this cross. With birth weights of 8–12 lb, fat lambs of 40 lb carcass weight were available for slaughter at 12 weeks of age. In addition, very little "tail" was experienced with the twin lambs, despite the fact that lamb crops varied from 150 to 175 per cent.

Over the years, many parties of visiting farmers saw these ewes and were not slow to appreciate their potential at a time when English lowland farmers were seeking grassland ewes, then scarce. However, it was one thing to know and appreciate what these ewes could do, but it was quite another problem to know the range of rearing conditions under which they could be reared initially. Obviously the Welsh Mountain ewes could thrive on the open hill and would rear lambs of their own kind there too, but prospective breeders were anxious to know if they would rear the Half-bred lamb on the hill.

With a view to clearing this point, a trial was run at Trawscoed for three years from 1950, when each year the Welsh Mountain ewes suckling Half-bred lambs were split into three equal and comparable groups. Normally these ewes lamb on the in-bye land in late March and early April. They are moved back to the hill in early May. Of the three experimental groups, one was retained on the lowland (200 feet), a second group on reseeded upland at 650 feet, whilst the third group was turned to the rough hill, which rises to 1,100 feet. The lambs in each group were weaned in mid-August. The live weight of the lowland and upland groups at weaning was 82 lb and 79 lb, having gained 39 lb and 37 lb respectively during the period of summer grazing. The lambs on the hill, however, weighed 60 lb at weaning, representing a gain of 19 lb per lamb. It will be seen, therefore, that those reared on the hill made only half the liveweight gain made by each of the other two groups. It is interesting to note that Welsh Mountain lambs grazing on the hill made a similar gain of 19 lb per lamb during the same period.

Whilst this trial had shown that the Half-bred lamb could be reared on the rough hill, it was obvious that in comparison with those on the reseeded upland they would be classified as "seconds", and normally only a small percentage would be likely to breed in their first year as ewe lambs. All the lambs reared in the trials in 1950 and 1951 were sent to the Boxworth Experimental Husbandry Farm, Cambridge, and in fact only 25 per cent of those reared on the hill reared lambs in their first year, compared with 56 per cent of those from the other two groups. At the yearling stage, the hill group with a lamb crop in excess of 150 per cent was as productive as those reared on the lowland and the upland.

As the trial indicated, the subsequent pattern of production of the Welsh Half-bred has taken in not only farms with hill grazings but others with much improved upland, now capable of rearing bigger lambs than the pure Welsh Mountain lambs reared hitherto. On these latter farms the economics are obvious. Whereas the fat Welsh Mountain lamb is worth £4 10*s*. to £5,

Photo: *Farmers Weekly*

Welsh Half-bred gimmers, which made top price at a Llangollen sale.

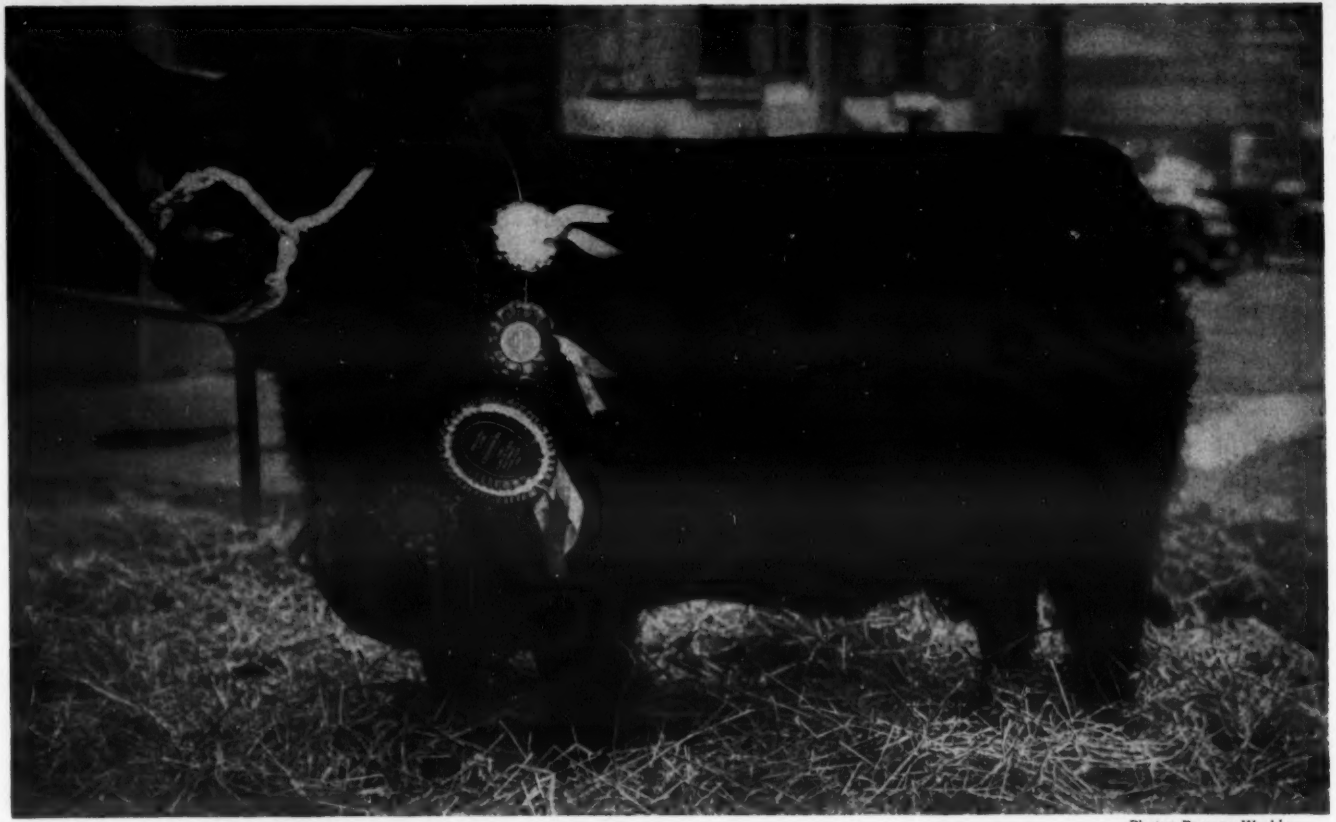
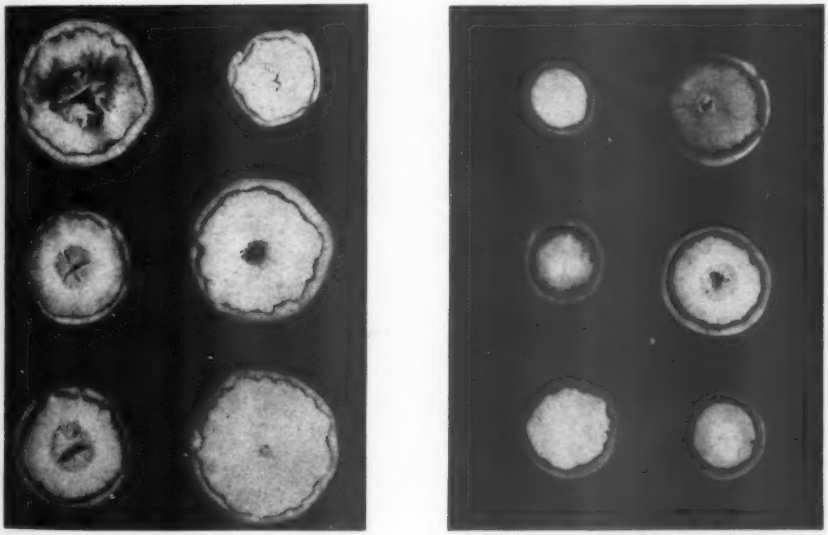


Photo: *Farmers Weekly*

Supreme at Smithfield, 1958

"Diana," an Aberdeen-Angus × Shorthorn heifer: 21 months old, weight 9¼ cwt.

Short thick-stemmed types of marrowstem kale (on left of marker) may prove useful for strip grazing with electric fencing.



Photos: *V. Chapman*

Sections (× 3) cut 6 inches above ground from spaced plants of marrowstem kale: *left*, from a cross between two short-stemmed types selected for low woodiness of stem; *right*, from a commercial stock. The rings of wood have been stained dark.

"Diana," an Aberdeen-Angus × Shorthorn heifer; 21 months old, weight 9¼ cwt.
Supreme at Smithfield, 1938

Photo: *Enit*

Commercial Horticulture in Campania (Article on pp. 522–25)

Terrace cultivation at Ravello.

the Half-bred wether lamb is worth £6, whilst the ewe lambs have been making £8 apiece. Undoubtedly the major development has taken place on this type of farm. Normally, full-mouthed ewes from the higher farms and open mountain grazings are bought at the autumn sales. The average productive life producing Half-bred lambs is two years. A factor which contributes to the undoubted vigour of the Welsh Half-bred is that each generation is bred afresh from the older mountain ewes that have proved their vigour by living and breeding for three or four years on the open mountain.

Development of Breeders' Association

With half-bred type ewes making very high prices in Scotland and the north of England, English graziers turned their attention to the similar type being bred in Wales. Pioneer buyers were very pleased with their purchases and the demand has continued to increase. To foster this trade, quite independently breeders formed sale associations in North and South Wales. The first sale to be organized for the sole purpose of bringing together the producers and prospective buyers of these sheep was held at Abergele in 1955. In December 1955, breeders from the north and south of the Principality got together and formed a national organization known as the Welsh Half-bred Sheep Breeders' Association. The aims of the Association are "to promote the breeding and to organize collective sales of the Welsh Half-bred sheep". The first sales arranged by the Association were in 1956, at Llangollen and Builth Wells, both centres of interest in the breed in the north and south respectively. Numbers of ewes and ewe lambs offered at these official sales have increased each year and in 1958 reached 20,000. Apart from the official sales, ewes of this breed are frequently offered at other sales throughout the Principality. The Association is anxious to provide a uniform first-class ewe, and with this in mind a close liaison is maintained with buyers.

An analysis of the 1958 sales catalogue indicates that whereas the interest in the breed extends throughout Wales, the centres of greatest activity are the counties of Denbigh and Brecon, which between them account for 50 per cent of the production. Radnorshire, Merioneth and Montgomeryshire each account for 10 per cent, whilst Caernarvonshire, Cardiganshire and Carmarthen each account for 5 per cent of the production.

Future development of the breed

Traditionally, the English grazier prefers to maintain his flock numbers with purchases of yearling and two-year-old ewes. With this class of ewe making high prices in recent years, there has been a tendency for buyers to turn to ewe lambs. The practice of breeding from ewe lambs in their first year is also gaining in popularity. Although this has been an accepted practice in many parts of the country, farmers generally are now appreciating that well-grown ewe lambs from early-maturing breeds and crosses are capable of substantial production in their first year without any apparent adverse effects later on.

A large proportion of farmers breeding the Welsh Half-bred have neither the tradition nor their farms the capacity—without reducing ewe numbers—to carry on the ewe lambs to the yearling or two-year-old stage. It is indeed

fortunate that English graziers are finding that a high percentage of these ewe lambs are capable of rearing lambs. The lamb crop is frequently from 80 to 100 per cent. Nevertheless, the ratio of ewe lambs to ewes offered for sale each autumn is rather high. In 1958 the proportion was three to one. The future of the breed would be more secure if the "seconds" were run on to the yearling stage. This aspect of development is now receiving its due attention. Many dairy farmers in Wales and in the Border counties are appreciating that this can be done with reasonable profit without the full implication of management associated with fat lamb production.

Standardization of type

Standardizing type is proving a more difficult problem to resolve. Although the Border Leicester rams generally are prepotent in stamping their likeness on their progeny and succeed to a remarkable degree in producing a uniform product, there remains room for improvement on this score. There is still too much variation in the coats of the Welsh Half-bred ewes; too many have "loose" coats. With the national flock reaching pre-war level, competition between and within breeds and types of sheep will get keener. There is considerable merit in "tight"-coated sheep, particularly in a high rainfall area. Generally, they are able to throw off the water and are more thrifty than "loose"-coated ewes. Unfortunately, a high proportion of the Border Leicester rams used so far has been of the "loose"-coated type. However, breeders are now raising their sights and paying more money for better types of ram.

As with the sire, there is a great deal of variation within the Welsh Mountain ewes used for this work. This is likely to prove a more difficult problem to solve, as the various types of ewes are generally specific to farming regions. The full weight of the preference of the buyers as reflected in the sale price will, I am sure, over a period of years be a deciding factor in establishing which types of Welsh Mountain ewes are most suitable for Half-bred production.

All these facts are receiving attention by the Association and breeders generally, which augurs well for the future of the movement.

References

1. Welsh Mountain Ewes as a Source of Grassland Breeding Ewes. J. H. S. WILKINSON. *J.R. agric. Soc.*, 1949, **110**, 76–88.
2. The Welsh Half-bred Ewe. W. M. R. EVANS and T. W. VALE. *J.R. Welsh agric. Soc.*, 1953, 55–63.

Smithfield, 1958

8th–12th December

E. St. J. Height

It is the proud boast of its sponsors that the Smithfield Show, presenting under one roof the finest British animals and the most up-to-date agricultural machinery, is unsurpassed anywhere in the world. Certainly few similar shows have their roots so deep in tradition.

The first Smithfield Show, organized by the newly-formed Smithfield Cattle and Sheep Society, took place in 1799, and in 1800 George III—"Farmer George" to the agricultural world—was the first reigning monarch to exhibit. First held at Wootton's Livery Stables, the Show later moved to Dixon's Repository in the Barbican. Then, no doubt with an eye to dramatic presentation, the promoters staged it on premises at Sadlers Wells. Subsequently, after a quiet sojourn in Baker Street, the Smithfield came to rest at the Royal Agricultural Hall at Islington, where it remained until 1938. Some six years later, when the nations were again showing some sign of beating the sword into the ploughshare, the show reopened at Earls Court, and has remained there ever since—the Mecca of farmers and butchers throughout the United Kingdom, and for not a few from overseas.

This year the pilgrims, both initiate and novice, were invited to a display of 1,429 live animals and 465 meat carcasses. The trade section, with a record entry of 390 exhibitors, showed a brave array of farming and meat trades equipment.

Some idea of the novelty and scope of the machinery exhibits this year can be gained by taking a random sample—eight new tractors, a new forage harvester with a patent cutter assembly, a counter scale for mobile butchers' shops which claims to give an accurate reading even when not level, and a mechanical, tractor-drawn stone-picker which carries and dumps its harvest of rubble.

But essentially it is the beast on the hoof and the price it will fetch on the hook which are at the heart of the Smithfield Show. This year, both farmers and butchers could gain some satisfaction from the fact that more producers were exhibiting. But there were not a few well-known names, both breeders and feeders, which were missing from the cattle lines. Top auction prices were £460 and £310, against four-figure lots last year.

"Diana," an Angus × Shorthorn heifer (only one-quarter Shorthorn) won the championship fresh from her triumph in Edinburgh. At 21 months and 19 days she weighed a little over 9¾ cwt. Bred by Mr. D. McKenzie, of Beauly, Inverness-shire, who by the way is a crofter, she was sold for £92 as a calf. Her owner at Smithfield was J. Sainsbury Ltd., who thus won the championship for the second time since the war.

There was no doubt about "Diana", but it was only after some re-examination of the rules that the main contenders were judged again to find the reserve champion, a pure Shorthorn heifer owned by Messrs. Bristow and Sons, of Surrey. An Angus heifer won the King Edward VIII Cup for the

best beast bred by an exhibitor and, of the nine inter-breed competitions, Angus won three, the champion won three, Angus crosses took two and Shorthorns one. Not a bad day for Scotland and not a wholly unexpected result since most of the nine entries came from over the border. On the following day the Beef Shorthorns vanquished the Angus team in the Norfolk Cup for teams of three steers.

The supreme award for sheep was at last wrested from the Hampshires by Col. Sir Robert Gooch's Suffolks. The best pair of pigs were Welsh, owned by G. M. and R. S. Barrett, and a Landrace shown by Wych Cross Estates was the supreme single pig and one of the pair which took the breed championship.

The Smithfield Show, like its smaller counterparts up and down the country, emphasizes the need for co-operation between producer and butcher. It is the carcass competition which focuses the searching eye of truth on the Show's value to both. In the 1958 Show, neither Mr. W. R. Chapman, of Norfolk, nor the buyer of his Angus steer could complain about the 668 lb of beef yielded from 9 cwt 22 lb live weight. Dorset Horns provided the champion and reserve lamb carcasses at 33 and 44 lb respectively.

Both farmers and meat traders feel that results such as these reveal clearly that there is now a more definite trend in livestock breeding and feeding towards producing what the consumer requires—lean, small joints with little excess fat or waste material which the butcher has to cut off. At Smithfield this year there were no fancy prices. No one bought the rosette and the prize card. All looked, and paid, for prime cattle. The prime beast is the one which will yield what the consumer wants and what he can reasonably be expected to pay for. Many such beasts were displayed this year. Well done, producers. Well done, the advisory services.

Britain's Food Supplies

The Department of Extra-mural Studies, London University, and the Association of Agriculture will hold a course of ten Wednesday evening lectures on Britain's Food Supplies between 14th January and 18th March, 1959.

The course will form a complete comparative study, and it is hoped that it will be of particular interest to geographers, economists and agriculturalists. Subjects discussed will include food and farming—Britain's position in the world today; the types of farming and food production in England and Wales, Scotland, Canada, Australia, and New Zealand; and Danish and European farming and our food imports.

The lectures will be held at 38 Russell Square, London, W.C.1. Application should be made to the General Secretary, The Association of Agriculture, 53 Victoria Street, London, S.W.1.

Dawlish Violets

WILFRED C. IBBETT, N.D.H.
National Agricultural Advisory Service, South-west Region

No more than 15 acres are given to growing violets in the Dawlish area today, but, says Mr. Ibbett, increased interest by growers may well follow the modern, more effective methods of pest control.

VIOLETS have been grown in the Dawlish area for many years, but it was not until 1891 that they were sent to Covent Garden Market by Fred and William Westcott of Cofton. Previously, Dawlish growers had sold their violets locally, usually in Teignmouth, Torquay and Exeter. But when the first consignments of the Westcott brothers made the quite fantastic price of 6*d*. per bunch in London, interest was aroused in sending away to distant markets. It is true that large bunches were the rule—as many as ninety flowers in a bunch—but even so, 6*d*. was a lot of money in the days when beer was 2½*d*. a pint and wages 13*s*. a week.

The Westcotts grew the large-flowered, scented Princess of Wales. They probably obtained the variety from Mamhead Gardens, where it was first grown in the district, and this variety is still very popular today. It is said that the first violets were sent to market in corset boxes; later growers made their own wooden returnable boxes, very similar to those used today. In addition to Princess of Wales, the Westcott brothers grew Parma violets in the garden of what is now Oak Park Hotel. As far as one can discover, these were the first Parmas to be grown in the district.

Fred Westcott finished growing violets about 1916. He was a pleasant character, and was often to be seen in his large sombrero wearing a huge bunch of violets in his buttonhole. He used to take his violets to the station in a donkey cart, on which was inscribed the words "Westcott Brothers, Cofton". When his brother died, friends suggested that he should have the word "Brothers" removed, but Fred said, "No, there are still two of us—myself and the donkey."

Earlier prosperity

The system of cultivation practised in those days did not differ greatly from that today, but instead of the proprietary fertilizers often used now, tailors' clippings at 2½*d*. a lb were dug in before planting. Rags were also used. There was an idea at that time that phosphates ("prostrates" as they were called by some growers) were unnecessary, and apart from rags and clippings and some dung, no manures were used. Besides Princess of Wales, Czar was also grown. The scentless varieties such as Governor Herrick were not introduced until much later.

As more and more growers sent their violets to London, prices dropped, but bunches became smaller. Before the 1914–18 war many were sold for 1½*d*. a bunch. During that war the price of bunches rose to 9*d*., and in the second world war, when flower growing was restricted, as much as 3*s*. 6*d*.

was charged. The peak period occurred between the wars, and probably the greatest quantity produced was in 1938, when it was estimated that 100–150 acres of violets were grown in the Dawlish district.

In the spring of that year, the London *Evening Standard* started a scheme to publicize Princess of Wales violets, and a Dawlish Princess of Wales Violet Growers' Association was formed to push an advertising scheme in conjunction with that newspaper. Besides this substantial publicity, medallions were fixed to each bunch of violets. Payment for advertising and the cost of the medallions came from a fund raised by a levy of 10 per cent on net returns. At a meeting in Dawlish attended by many local growers on 11th February 1938 it was stated that "tabbed" bunches were fetching 1*s.* 6*d.* to 2*s.* per dozen more. This scheme, however, did not last very long. The war came and put an end to what was the first national publicity scheme for flowers.

Though no longer what it once was, violet growing is still of interest to growers in the Dawlish area. It provides a useful and very necessary rotation when growing such crops as anemones, which must be planted on fresh land each year. It also gives employment to the regular workers on the holding during autumn, winter and early spring, and brings an income to the general grower during the quiet months of the year.

Present cultivation

The methods practised have not changed much. Princess of Wales, a large-flowered scented variety, is still the most widely grown, but Czar is often used for early picking. Governor Herrick, a strong-growing scentless variety, is grown in the district but is not very popular, some growers thinking that it has spoilt the market for the scented kinds.

The new variety, Tina Whitaker, has not been taken up locally, despite the fact that it is the largest-flowered violet and one of the most fragrant. It is, however, exceedingly difficult to root, and in consequence is expensive to buy. Pamela Zambra (Bournemouth Gem) is grown to some extent. It is a good market variety, with strong stems, and fragrant flowers which last well. There appears to be little interest in the semi-doubles and doubles, though Princess Mary, a seedling from Princess of Wales, is sometimes seen.

Violets will grow on a variety of soils, but those in the Dawlish area are usually to be found in the Red Sandstone, which is well drained but tends to dry out quickly in summer. Violets need a pH of about 6·5 to 7, and are usually planted on land that has been well manured for a previous crop, though some growers plant following a ley. Shoddy and seaweed are used, and are supplemented by proprietary fertilizers usually containing about 6 N, 6 P_2O_5, 9 K_2O. These are worked into the soil two or three weeks in advance of planting. Propagation is mainly by runners. The common method is to take short-jointed, partially rooted runners from the parent plants in April for immediate planting. Another is to lay tufted runners thickly in nursery rows in October, for planting the following spring.

Plants are usually put out in April, using autumn runners that have rooted during the winter, or runners taken from the flowering plants. The best growers are careful to select their runners from good healthy stock. It is usual to plant Princess of Wales at 18 inches apart each way, or in beds of

four rows with picking alleys between each bed, when the plants are put out at 15 inches apart in the rows. The stronger-growing varieties are given more room—at 24 inches apart each way.

To control aphid and the red spider mite, the runners are dipped in HETP before planting. Irrigation is sometimes used, especially if dry weather immediately follows planting—this also helps to prevent red spider attacks. The plants are kept hoed and the runners removed from the scented varieties throughout the summer. If red spider is very troublesome, some growers strip off the leaves from susceptible varieties such as Princess of Wales, usually in June; but Governor Herrick does not need this, nor does it need de-runnering.

Usually violets are treated as a one-year crop, but some growers keep them for a second year, mainly to provide leaves for bunching. A few growers in the district cover some of their plants with continuous cloches, but this practice is not so common as it once was, because of the extra labour involved in moving the cloches.

Pests and diseases

The red spider mite (*Tetranychus telarius*) has been the bane of violet growers for many years, especially in dry seasons. This pest and aphids are by far the worst troubles in the Dawlish area. Until recently most growers used to rely for control of red spider on stripping the affected foliage in late June, while some favoured spraying with derris extracts or with high-grade petroleum oil. Nowadays, growers are getting an excellent control with proprietary insecticides; one which contains the active ingredient demeton methyl controls aphids as well. It may well be that now control of red spider is possible, more of the scented varieties will be grown again. Slugs and snails are a plague in wet seasons, especially in enclosed gardens. Most growers use baits of metaldehyde and bran, or spray with liquid metaldehyde, but some are going back to the old-fashioned Paris green and bran bait. Aphids are now relatively easily controlled, most growers using HETP or demeton methyl. At one time, eelworm (*Aphelenchoides fragariae*) was quite serious, but it now seldom appears in the district.

Two leaf spots, *Ramularia lactea* and *Phyllosticta violae*, occasionally give trouble, but they are controlled by spraying with diluted Bordeaux mixture.

Picking and marketing is a costly business nowadays. Before the war it was usual for the families of growers to do much of the picking, but at the present time most of it is done by the regular staff of the holding. The flowers are gathered as early in the day as possible, when fully open, as they do not open further after picking. The pickers make large bunches which are taken to the packing shed. Here the blooms are sorted, and damaged ones discarded. Growers differ in their methods of grading and packing. Some prefer to put their best blooms in large round bunches of 48; others bunch in smaller bunches and do little grading. Bunches of 18, 24, 30 and 36 blooms are common. Each bunch is backed by a few leaves, usually taken from two-year-old plants. The practice of using the leaves of the winter heliotrope (*Petasites fragrans*) for bunching after Christmas, when violet leaves are scarce, is not very popular with the trade. The bunches are usually secured

by raffia, though rubber bands are sometimes used. It is usual to stand the bunches in water for a few hours before packing in wooden returnable or cardboard non-returnable boxes, the pack varying with the size of the bunch. The boxes are lined with white sulphite paper and, when well packed are most attractive.

If the method of packing is little changed, the actual transport to the station has altered considerably. Instead of the horse or donkey and cart, with its load of boxes, all sorts of vehicles are used. Trailers behind cars (often of ancient vintage) are commonly used, but light vans, bicycles, even hand trucks, can be seen on their way to Dawlish or Starcross railway stations.

Future of the industry

The second world war seriously affected violet growing. Acreages were restricted by law, and food crops had to be grown instead. After hostilities ceased there was a resumption of violet culture, but the acreage has never reached its pre-war peak, and now it is not more than 10–15 acres. There are various reasons for this. The introduction of the scentless varieties which produce fine large blooms from plants highly resistant to red spider has, in the opinion of many people, spoilt the trade in cut blooms; for after all, what is a violet without scent? Fashions also change, and the habit of wearing fresh flowers as buttonholes has declined. Costs have risen, especially the price of picking, and the days when the whole family went out picking are gone. Prices have not kept pace with costs, and anemones have tended to take the place of violets amongst growers, though this crop is now running into trouble. However, there seems to be rather more interest in violet growing now that pest control is so much more effective, and whilst the industry may perhaps never regain its former importance, the present acreage may increase. One local nursery, which specializes in violet plants and stocks sixty varieties, exports plants to many parts of the world and reports an increasing interest.

★ NEXT MONTH ★

Some articles of outstanding interest

GRASSMANSHIP *by Ian Moore*

LABOUR REQUIREMENTS FOR SUGAR BEET *by J. S. Mix*

WEED CONTROL IN PEAS *by J. D. Reynolds*

FIRE BLIGHT *by R. A. Lelliott*

Eleventh World Poultry Congress

RAY FELTWELL, N.D.P.

A commentary on some of the principal papers read at the Congress held in Mexico City on 21st–28th September, 1958.

THE poultry industries of the world are striving to produce more and cheaper poultry meat and eggs, both valuable sources of protein. This is evident at once from the scope of, and interest shown in, the Eleventh World Poultry Congress held last year in Mexico City. Forty-seven countries reported and discussed a great deal of original scientific work, some confirming what was already known and some opening new fields of research. Certainly, few branches of livestock rearing can vie with the almost sensational development which is taking place in the poultry industry.

In any assessment of the work covered by a congress of this kind, one has to distinguish between the purely scientific findings and those of practical application, either at once or in the near future. Much of the scientific work reported remains inconclusive—for example, such interesting experiments as those carried out by the Russians, who claim to have established that characters can be transferred from one class of stock to another by means of blood transfusions. The Swiss have interested themselves in similar studies, and their findings go some way towards confirming the basis of the Russian investigation.

We heard details of the immensely interesting work on parthenogenesis in turkeys, which was started on the United States Department of Agriculture's Research Farm at Beltsville, Maryland, and reported by Doctor Kosin from Seattle, who has done a great deal himself in this field. The work concerns the rearing of turkeys from eggs which have not been fertilized in any way whatsoever (A.I. included), and we may expect to hear more about it in the future. At present it remains just another of those advanced fields of research which may well come to play an important role in the industry, and it gives some idea of the range of current research.

Food and feeding

On the more practical side, there is a growing appreciation of the benefits to be derived from restricted feeding during their growing period of replacement pullets and turkeys for breeding. The advantages claimed are increased production of large and more uniform eggs—of special importance to the producer of hatching eggs, because small eggs are unsuitable for hatching; potential breeding birds are prevented from becoming too fat—which is claimed to help guard against early season infertility in breeding turkeys; and the pullets grow more slowly, with less danger of prolapsus.

Feeding is restricted principally by rationing the food to about 70 per cent of the normal intake or using rations containing from 12 to 20 per cent (a high proportion) of fibre. The results appear most promising and are certainly worth careful consideration and further work.

The biggest individual section of the Congress, on nutrition, contained

some interesting recommendations and new theories on work already carried out. The use of pre-starter rations for broilers and turkeys is being dropped, for example, and popular broiler rations are recommended to contain some 22–23 per cent protein with a Calorie protein ratio of 42:1. Turkey starter rations contain 28 per cent protein with a Calorie protein ratio of 30:1.

Considerable interest has been aroused by reports at the Congress that the nutritional value of some foods can be improved by the use of enzymes. It is claimed that certain strains of barley, when treated with water, give improved growth, food utilization and drier litter. The enzyme supplements are also being added to some feeds. Results, however, are varied, and doubtless more work will have to be done.

There is new information about the implantation of synthetic hormones in turkeys. In tests on Broad-breasted Bronze and White birds, treatment at 17 weeks appeared to be effective, but turkeys 25 weeks old did not seem to respond. The injections suggested consisted of a combination of 10 mg diethyl stilboestrol and 3 mg methimazole. Treated birds are claimed to have shown an improvement in finishing grade and absence of "treading"—which would result in cuts and tears and thus reduce the finished quality of the bird.

An interesting account of the housing of laying birds was given by Swiss workers. It concerned a windowless house built in 1956, and designed to house 2,600 birds in two flocks on two floors—that is to say, a double-shift house. The novel feature of this house is that one flock sleeps while the other uses the floor, nest-boxes and food and water receptacles. Such a house accommodates double the normal number of birds. The results are apparently most encouraging, and confirm the work carried out at the same time at Harper Adams Agricultural College. The house used a special ventilation system, involving thirty air changes per hour. Automatic methods of feeding and roll-away nests were used. Droppings were removed by an electrically-driven belt.

Deep litter

Much thought has been given to deep litter—referred to at the Congress as compost litter—with particular reference to its full potential use, both nutritionally and as a comparatively disease-free medium.

On disease control, experiments were mentioned in which over thirty batches of broilers were reared on unchanged litter, with no difference in the health or mortality of the birds when compared with those raised on new litter. It was concluded that coccidiosis was not therefore a problem where compost litter was concerned. In addition, it was shown that there need be no problem of worm infestation. The work also claimed that salmonella infections disappear more readily from compost litter than from new litter, and that the health and egg production performance of pullets reared on compost litter could be just as good as those of birds reared on other systems.

The possible nutritional value of compost litter was shown to be due to the many micro-organisms present in old litter, and to their biological activity. Such nutritional values should be regarded as purely complementary to feed, or as a safety margin, and not taken into consideration when compiling rations.

On the question of temperature, the arguments in favour of compost litter were that it maintains a better floor temperature because of its insulating effect and heating action. In cold weather, the temperature of the litter is higher than the general temperature inside or outside the house.

Coccidiosis and encephalomyelitis

On the disease front, the nitrofurans have shown themselves to be effective against the coccidia *Eimeria tenella* and *E. necatrix*. Levels of 0·0035 per cent and 0·0065 per cent were shown to have a slight depressive effect when the treatment was extended to twenty-one days. There was a significant depression of growth rate at a usage of 0·0071 per cent. Certain strains of coccidia may be developing resistance to the drugs normally given in the food—nitrofurazone, sulphaquinoxaline and nicarbazin. This conclusion can be drawn from experiments with *E. tenella*, in which raising the levels of the coccidiostat in the ration had no effect. Reports confirmed the part that can be played by good husbandry and management in the control of coccidiosis.

A new drug, trithiadol, was reported to be effective when used at the rate of 2 lb per ton of feed against many strains of coccidia, including *E. tenella*, *E. necatrix* and *E. maxima*.

There is evidence to support the belief that encephalomyelitis can be passed from the breeding hen to the chicks—either in the eggs or on the egg shell. Intramuscular vaccination of immature breeding stock with an inactivated vaccine is giving promising results. The breeding hens develop immunity following such treatment. Protection in the experiments ranged from 5–7 weeks.

Egg quality and tender meat

Egg quality came in for some interesting comments, and it was held that dry-cleaned eggs have a longer storage life than washed eggs. The commercial use of egg-washing machines does not effectively control rotting caused by microbes. The use of a mild disinfectant in the washing water is claimed to be of some help. Shell pasteurization appears to be a suitable method of treating eggs before cold storage: they are dipped for three minutes into water at 144·5°F.

It was shown that eggs from a deep-litter unit contained fifteen times more bacteria than eggs from batteries, chiefly owing to contact with hay, straw and stale droppings in the nest. From this information, the use of sawdust is recommended for nest-boxes, together with the frequent changing of litter in the nest.

The value of efficient candling to detect poor quality and flavour in eggs was demonstrated, and it was interesting to learn that the higher the candled quality of stored eggs, the higher was the flavour score in one series of experiments. Eggs stored at room temperature lost flavour rapidly, thus emphasizing the need for sound methods of egg storage, both on and off the farm.

Very useful information on marketing was given from a number of sources. Interesting tests on the flavour of broiler birds were made with old and new types of broiler chicks raised on 1930 and 1956 rations respectively. Growth

and food conversion were conclusively better from "new" birds fed on the 1956 diet. It is suggested that the advances in both feeding and breeding have made about equal contributions towards efficiency in broiler production. But in the same tests neither showed any influence on flavour. The increased sale of "oven-ready birds" has probably contributed more to any flavour differences between modern and old style birds than have advantages in feeding and breeding.

Tenderness of poultry meat was another of the marketing points discussed, and bad processing was blamed for toughness in both chicken and turkey meat. It was recommended that to help preserve tenderness twelve hours should elapse after evisceration before freezing; scalding should be as mild as possible; excessive or prolonged handling in mechanical plucking should be avoided, and birds should be stored cold, at about 27°F.

Commercial Horticulture in Campania

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Campania is one of the most luxuriant regions of Europe, yielding an abundance of fruit, wine and vegetables.

LAST summer I flew into Campania, which may be described as the "shin" of the long leg of Italy. There are five provinces—Avellino, Benevento, Caserta, Naples, and Salerno, and it includes, of course, the beautiful Bay of Naples, the Isle of Capri, and the Gulf of Salerno. Avellino and Benevento are for the most part mountainous, but a great variety of produce is grown: potatoes and maize everywhere, olive and fruit trees in the fertile valleys, the famous cob-nuts on the low-lying slopes and chestnuts higher up.

The other three provinces have very different characteristics. Although they do not lack hills and mountains, there are vast plains with areas of exceptionally intense food-growing activity. In these areas the ground is cultivated on at least two levels, and often on three, and where the soil is richest, the cultivation is on four levels: vegetables, vines, fruit trees, and, higher up, walnut trees which yield first-class produce. Intercropping is markedly intensive by English standards. Because the sun is so high and there is hardly any shade between one plant and the next, market gardeners not only grow tomatoes between cauliflowers, and potatoes between maize, but also have officially-recognized schemes for the intensive intercropping of various fruit trees with one another and with bushes. Not an inch of ground is wasted. There is a tremendous variety of crops in the region, which covers some 5,250 square miles. It is one of the most important horticultural zones of Italy, and supplies not only the biggest Italian cities but also several countries in Europe.

As in Spain, there are no co-operatives. The Italian market producer is a

successful, independent grower who makes a very good living from even a small acreage. Every market gardener I visited had his own means of transport. Some get their water for irrigation from artesian wells; others have facilities for drawing water from the numerous canals, which are filled from the network of watercourses covering much of the great plain.

The produce is sold to wholesalers in markets set up within easy reach of the main market-garden areas. Growers from the more distant parts arrive with their lorries about seven o'clock in the evening: they sleep all night on the spot, and sell their produce the next morning. Market gardeners from close at hand arrive about four in the morning: business begins at about six and is over by ten. Sometimes the wholesalers go straight to the market gardeners to buy large quantities of produce, particularly walnuts, oranges, lemons, and apricots.

Efficient training and advisory services

There is little doubt that much of the Italian market gardener's great success in this region is due to the extremely efficient way he is taught, both commercially and technically. Each province has its own chief horticultural officer, who has about twenty technical advisers to help him. Many growers come to his offices for advice and are visited periodically by his staff. Courses are run in county towns every year, and films are widely used. Each province publishes its own Advisory Journal, which is sold to the producers; this pays for itself. Every subscriber in Italy is entitled to advice and suggestions from technical advisers, whether or not he is a commercial grower.

The University of Naples has its own centre of agricultural instruction at Portici, with professors of fruit-growing, market gardening and so on. There are thirteen different Chairs, and while I was there 500 students were receiving instruction. They study for four years, but do very little practical work. Lessons begin at 8.30 in the morning and end at five in the afternoon, with about an hour's break for lunch. Fees come to about £20 a year. All the students live out.

I was taken one day to an experimental farm of 48 hectares at a place called Torre Lama, where trials are carried out along modern lines to produce new strains of tomatoes for the canning industry, and of Cantaloupe melons, seedless water-melons and peppers. They have achieved gratifying results. Fodder plants, tobacco, cotton, and *ricinus* are also being tried. The irrigation is on the overhead system with electric pumps, and *Eucalyptus globulus* is grown to provide windbreaks. Each field covers one-third of a hectare, so making it easier to estimate the results of the trials. The fields are invariably divided by rows of peaches, apples and pears.

Varieties of grapes are grown, both for the table and for wine-making. The Trebbiano white grape (considered to be one of the best Italian wine varieties in this area) is grown here in lines 2½ yards apart.

One of the most fascinating visits I paid was to Professor Domenico Casella, who has been Professor of Fruit-growing at Naples University since 1935. He is a great admirer of the East Malling Research Station. He has six hectares of land given over to fruit-growing and one of the most wonderful collections of citrus and sub-tropical fruits in the world. Prof. Casella has shown by his careful examination of the pictures and drawings found in

the excavated buildings at Pompeii that, even as long ago as that, they had white currants, lemons, oranges. Mirabelle plums, Bon Chrétien d'Été pears, varieties of cob-nuts and figs such as we have today, almonds, pomegranates, apples, chestnuts and even pineapples. He deserves the highest praise for his researches, and his wonderful photographs and reproductions ought undoubtedly to be published for all the world to see.

Typical market gardeners

A typical market gardener in Ponticelli runs a plot for himself and his family, and pays a rent of £60 a year. An electric motor raises as much water as he needs, and I was told that he generally makes about £1,000 a year. He intercrops radishes between aubergines, chrysanthemums between tomatoes, and turnips around the edge of his plot. Maize is intercropped between his French beans and, of course, all these plants have furrows between them to channel the water.

Sig. Emilio Buodonno of Castellamare, near Capri, is a grower of some importance, with about ten acres at his disposal. His income is about £8,000 a year from excellent globe artichokes, grown on a four-feet square basis, with French beans and peppers as intercrops, and a great quantity of chicory, potatoes, salads, and cauliflowers. He thinks nothing of driving his truck 180 miles to Rome, the best market for his produce. His artichokes are cut down to ground level each year in October and, much to my surprise, grow up again far more luxuriantly the following season, yielding well in February, March and April.

There are some 3,000 market gardeners in the region of Castellamare. The workers are happy and contented, earning about £4 10*s*., plus a simple midday meal with wine, for a 52-hour week. The land is especially fertile in this area, because it was originally under water and has been reclaimed. The growers draw their water from the river Sarno, at no expense to themselves.

Sig. Francesco de Vivo of Fratta (Salerno) has his own market garden of six acres, and specializes in tomatoes, capsicums, aubergines and peas, not to mention globe artichokes, intercropped with capsicum every year. He is very keen on a Dutch variety of potatoes called "Sieglind", which he has introduced to strengthen the Italian varieties (the latter have shown themselves to be more subject to certain diseases). Fennel, planted in November and cut in April, is another of his favourite crops—it is followed by capsicum.

In 1958 Sig. de Vivo was carrying out tomato trials for the University, concentrating on the Sanmarzano variety for the canning industry. Samples were periodically sent to the University, to be analysed for their sugar content, firmness and facility of peeling. All the plants were staked, and allowed to grow until the end of August. They were then thinned out, to hasten the growth of the young tomatoes already on the plant and dry off the plants themselves, so that they did not damage the young cauliflowers growing up between them.

I was very interested in a specially shaped earthenware pot made to fit over the small heads of the artichokes. It keeps them tender and at the same time encourages quicker growth.

Cantaloupe melons are grown in the open, with the main stalk cropped at the second joint, the lateral stems cropped at the fourth joint and the fruit-

bearing stems at the second joint of the fruit. In Sig. de Vivo's garden they are four feet apart and there are double rows of red peppers in between.

Some specialist growers

Market gardening is not the only activity in Campania. There are also firms which specialize in growing flowers and producing seeds. I was especially impressed by one firm, which devotes more than 100 acres to seed growing. The seeds are sent to England in great quantities, and in September many seed growers come here to see the trials. The asters were particularly remarkable. An interesting method of growing Roman hyacinths is used. Dr. Pietro Ermice, of Resina, plants them under the trees in the orchard and leaves them there for three years. He weeds the ground in early August and waters and manures it: soon after this the hyacinth leaves appear. He then gives them still more artificial manure and not long afterwards cuts the blooms, which are sent to London. He now has more than 45,000 plants from 2,000 bulbs imported from Hong Kong in 1955.

By growing gladioli in the open until he has cut the flowers, then transplanting them to a greenhouse in October, Dr. Ermice gets two crops of flowers from the same plant in twelve months. His aubergines were spectacular—over four feet high at the end of June. The seed was sown at the end of February and the plants put out on 7th May. Aubergines are one of his most profitable crops, since they are extremely popular in Italy.

I met the grandson of the founder of a firm which has a large packing station at Sorrento. He claims that the walnuts and oranges of Sorrento are the best in the world. His firm have a number of enormous cellars, equipped with a series of fans, and there they keep oranges for as long as twelve months if necessary, to sell when prices are high. All their walnuts are graded by machine, carefully washed, and each nut stamped with the firm's name. Then they are automatically packed into 1 lb transparent packets, which also bear the name. The publicity is first class: Italian agents in London have no difficulty in placing them. The firm has a plot of 25 acres and I was shown their system of growing oranges. Above the trees, long crossbars placed every 6 feet on poles 20 feet high carry specially designed covers of rye straw, which give excellent protection from sun or frost. The cost of erecting this special protection, which lasts about twelve years, is about £1,500 an acre; it increases returns by about £150 an acre.

Lemons are grown in the coastal areas, because they do not need such deep soil as oranges. Apricot growing is widespread throughout the area around Vesuvius, and great quantities are exported to Britain.

I found unexpectedly an enthusiastic orchid grower near Portici who grows over 40 different species, which he sells in special boxes with transparent covers in cities such as Rome, Milan and Naples. It has proved to be a very profitable business.

I should like to record my gratitude to His Excellency Count Zoppi, the Italian Ambassador in London, to Cav. Andrea Luciano, the Director of the National Institute for Foreign Trade in Naples, Dr. Italo Busico, Assistant to Professor Angelini of the Horticultural College in Naples, and to Sig. Mario Grimaldi and Dr. Franco Mucci, who so ably acted as interpreters.

N.A.A.S. Experimental Husbandry Farms

Kirton

A. C. OWERS, M.A., DIP.AGRIC. and J. WOOD, A.R.C.S., D.I.C.

WHEN the Ministry's chain of experimental centres was set up within the N.A.A.S., two farms on highly productive silt land bordering the Wash were acquired and linked together as the Kirton and Terrington St. Clement Experimental Husbandry farms. Besides taking part in national trials, their aim is to serve the special needs of the area of rich alluvial soil which stretches from King's Lynn in the east to the Wisbech area in the south-west and Boston in the north.

This silt area of the Fens is noted for its high productivity and wide range of crops, including potatoes, vegetables, bulbs and soft fruit, as well as the more usual farm crops. Both farms had previously been engaged in experimental work—Terrington as an experimental farm for the Norfolk County Council, and Kirton as a demonstration and experimental centre for the Kirton Farm Institute. The farm at Terrington, near King's Lynn, on the Norfolk-Lincolnshire border, consists of 205 acres of medium-heavy silt mainly under arable cropping, and has previously been described in this JOURNAL.*

The Kirton farm, of 103 acres, is in the Holland division of Lincolnshire—4 miles south of Boston and ½ mile north-west of Kirton village, on the B1192 road from Kirton to Swineshead. As at Terrington, the contour is extremely flat, and only 14 feet above sea level. The average rainfall is about 22 inches a year. For administrative purposes, the farm is classified as an Experimental Husbandry Farm, but most of its programme deals with horticultural crops: it is intermediate between an experimental farm and a horticultural station. This is typical of the district, for throughout the area agricultural and horticultural crops are intermingled, occurring in the same rotation on most holdings.

One farm: two soils

The farm, which is conveniently divided by a good public road, has two very distinct soil types. To the north of the road, there are approximately 45 acres of light easily-worked silt, very characteristic of the soil of the district on which bulbs and vegetables are grown. To the south, there are 55 acres of much stronger-bodied land, typical of the surrounding areas which are mainly covered with agricultural crops. This division makes it convenient to run the farm on two rotations: *heavy silt*—potatoes, wheat, sugar beet, barley, peas; *light silt*—canning vegetables including peas; bulbs, wheat, sugar beet, vegetables, barley.

It might be expected that early potatoes would be the preparatory crop for bulbs in the light silt rotation, but frequent cropping in the past with potatoes

* *Agriculture*, 1957, **64**, 171–4.

has multiplied potato root eelworm throughout the whole area. The light land fields on the farm are heavily infested, and it was here that much of the original work on this pest was done. The work continues, but no control measures other than a long rest from the crop have proved satisfactory. For this reason, the early potato shift has been replaced by canning peas or vegetables which can be cleared from the ground before August to make room for bulbs.

The soil on both sections of the farm is low in organic matter, and to prevent further deterioration farmyard manure is applied at least once in each rotation. On the light soil it is applied for the vegetable crop, while on the heavy soil it is given for the maincrop potatoes. All straw produced on the farm is made into muck. In the past bullocks were used, but more recently they have been replaced by an expanded herd of pigs. This fits well into the general farming pattern, for the greater part of the pigs' carbohydrate requirement is produced on the farm as cereals or by-products of the arable crops. About 30 sows are kept and all their progeny are finished on the farm, either for pork or bacon.

In the account of the Terrington farm previously given in this JOURNAL, a scheme for the eradication of virus pneumonia was outlined. The herd at Kirton is also taking part in this work, the testing of old sows and their litters being undertaken there before clean offspring are transferred to Terrington for further examination. Two pedigree breeding herds are maintained—Essex and Large White—together with crosses from these breeds which are used in the experimental programme. As soon as testing for virus pneumonia has been completed, the original breeding stock at Kirton will be cleared and replaced by clean breeding stock from Terrington. The breeding herd is kept out at grass throughout the year, and an outside system of farrowing is also used, the sows being confined to wooden huts and runs. Normally, weaning at 8 weeks is practised, after which the pigs are removed to yards or the fattening house for final finishing. In addition, some long-term investigation is continuing on how early weaning of litters may affect the breeding life of the sow.

Experimental programme: bulbs and vegetables

The main part of the experimental programme centres around bulbs and vegetables. Experimental work on bulbs demands the greatest attention to detail, for not only can current treatments cause variations but, since the bulb is already a mature plant, previous treatment can profoundly influence results. For this reason two completely separate stocks have to be maintained—one for commercial use, and one for the provision of standard material for future experiments.

In a long-term investigation of the fertilizer requirements of daffodils and tulips, little response to any of the major plant foods has been noted in the first experimental year, but when the same stock of bulbs is continuously subjected to the presence or absence of nitrogen, phosphorus and potash over a number of years, marked responses begin to occur, particularly to potash.

Much of the work at Kirton has dealt with methods of eradicating weeds from the crops. Both tulips and daffodils are planted in the autumn and

remain in the ground until the following July. Previously, all cleaning was done by hand, but the introduction of a wide range of chemical weed-killers has now provided an opportunity of reducing the cost of producing the crop. With cereals, the value of a weed-killer can be assessed in one year, but with bulbs the problem is much more difficult, for it is necessary not only to determine the immediate effect on yield, but also to discover what influence there is on quality and performance of the bulb in subsequent years. Among contact weed-killers, sodium arsenite and PCP have proved useful as pre-emergence sprays, and CIPC has given good results from early spring application, provided all weed growth is controlled or removed beforehand. In an attempt to control all annual weeds throughout the growing period, experiments are now in progress using a contact weed-killer in the autumn followed by CIPC in the spring. Results so far are quite encouraging.

Work is also being done on pest and disease control. Recently, tulip eelworm has become much more prevalent in the area and, although it does not yet present a problem on the farm, the effects of likely control measures on the bulb and future flower are being carefully watched. Similarly, new fungicides are constantly being tested against such diseases as tulip fire and compared with standard materials in common use.

As a sub-centre of the National Institute of Agricultural Botany, Kirton undertakes variety trials on brassicas, beet, lettuce and canning peas. The main emphasis is on early cauliflower, and in 1957 and 1958 over one hundred strains were grown in an attempt to classify them and determine the best varieties to carry forward to future large-scale yield trials.

The farm also has its own experiment dealing with blindness in early cauliflower, a problem causing considerable losses in the area. Some of the factors predisposing to blindness, such as effect of temperature, have already been determined, but others such as variety and effect of day-length on the seedlings, and interactions between these factors, are still under examination.

Future plans

The current work on bulb production deals almost entirely with cultural and manurial problems in the field, and covers only some of the problems facing the bulb industry. Already a small specialist unit is at work at Kirton to determine the exact nutritional requirements of bulbs by the sand culture method. At present this work is concerned only with major plant foods, but as facilities become available it is proposed to cover the full range of plant nutrients, including the minor elements,

The bulb industry depends on the forced flower trade to provide an outlet for its products, and there is great need for further experiments on the techniques used in processing and preparing bulbs for this market. Accordingly, provision has been made for the construction of an experimental cool store and the necessary forcing houses, which will also provide facilities for following up in the second year the effects of the preceding year's treatments in the field. This is particularly important in the work on weed and disease control, for cases have already occurred where new chemicals have given good control of either weeds or disease but have damaged the flower-bud in the bulb, making it useless for forcing.

Farming Cameo: Series 2

10. East Cornwall

A. L. JACKSON, B.SC.
District Advisory Officer

THE market town of Liskeard is the centre of this varied district which includes wind-swept Bodmin Moor and the less exposed Channel coast, with its popular seaside resorts. The area is separated from Devon by the sheltered Tamar Valley, where small horticultural holdings specialize in the production of flowers, strawberries and vegetables.

Agriculturally, the district is dominated by the massive granite intrusion of Bodmin Moor, where the black upland soils lie between 700 and 1,200 feet above sea level. In this hill farming area, the larger farms are still concerned mainly with the production of store cattle and a few store sheep. The cattle are indigenously North Devons, but for some time much crossing has been done with Hereford and Galloway bulls, and there is now a strong tendency to produce pure Galloway breeding herds. The breeding sheep are Devon Longwools, often crossed with Dartmoor rams; and there are a few Exmoor and Cheviot flocks. There is generally an extensive system of farming, facilitated by the large areas of common grazing on the moorland. This moorland grazing is largely a *molinia*/fescue sward, heather being much less dominant than it is on the moors in the north of England or on Dartmoor; it rarely has much snow and is consequently much more productive than moorland elsewhere in England. The Hill Cow Subsidy is of considerable significance in these enterprises, and many holdings have been improved under the Livestock Rearing Scheme.

Scattered amongst these large farms, however, are many smaller, which have insufficient capital to develop a livestock rearing system (with its advantages under the Livestock Rearing Act), and have adopted small dairy herds and pig and poultry units for quick returns, often in very uneconomic circumstances. These are the typical small farms of Bodmin Moor which, from an economic point of view, can be linked with the small farms of the adjoining district.

They are situated mainly on the fringe of the moor, on land lying between 500 and 700 feet, where the soil is a mixture of black granite and red Devonian. Here much of the land is steep, and most of the farms between 5 and 50 acres, originating when the underlying mineral wealth was exploited a century and a half ago. Mining in those days was done on a type of piece-work by independent mine workers, who often developed a small holding in the vicinity during their leisure time. Many of these farms are still designated as part-time holdings, rarely being economic unless output can be increased by intensive forms of production or the acquisition of more land. At present they are occupied by men and their families working on larger farms in the district, at Devonport Dockyard, or as bus drivers or garage hands and in the china clay industry. But there is only a very limited

amount of alternative local employment, and a number of these farms are now in straitened circumstances. The solution of their general problem is difficult to foresee, as not all of them are likely to obtain any great benefit from the Small Farmer Scheme. As potentially uneconomic holdings, they are not readily eligible for grants under the Farm Improvement Scheme, and the ending of the Marginal Production Scheme has removed the last means of ensuring that soil fertility is maintained. Amalgamation is a possible solution, but it is taking place only very slowly. These holdings have survived the economic hazards of some 400 years, however, and are not likely to become vacant now.

The coastal district between the 500 feet contour and sea level, is undulating land of metamorphosed red Devonian rock, sharply intersected by steep, wooded valleys which carry the water from Bodmin Moor southwards to the sea. The rainfall in these parts rarely exceeds 50 inches, and the winters are mild, with little frost or snow. The soil is rather better than on the adjoining highlands, being free draining but requiring regular applications of lime and fertilizers to keep leys and arable land in good condition. Permanent pasture, much of which is to be found on the steep valley sides, is rather neglected, being difficult to maintain in full production. The farms usually range from 75 to 150 acres, and are generally quite economic.

Cattle are still, to some extent, of the South Devon breed for milk and beef, but latterly these are tending to be replaced by the pure dairy breeds to produce a cattle output based much more on milk than on beef. Mutton and wool are derived from the Devon Longwool breed, very often crossed with a Suffolk ram to produce more marketable lamb. Recently a few Down rams have been introduced to produce very early fat lamb, which has found a ready market. These farms also have their pigs and poultry, which are fed largely on bought feed, a state of affairs which demands a highly efficient system of management to maintain a satisfactory profit. "Bed and Breakfast" for tourists is another remunerative sideline. Although generally economic, these farms are burdened by buildings which are by no means suited to modern forms of production. The yard-and-parlour system is being accepted by many as the cheapest and simplest way of putting their antiquated layouts in efficient order. The Farm Improvement Scheme is proving invaluable to them.

This sketch of the agriculture of East Cornwall shows that it is one of great variety. The rainfall, up to a maximum of 70 inches, is spread evenly throughout the year, and the absence of cold winters ensures that grass is available for nine to ten months in the year. Many farmers have learned to make good use of the grass by the efficient use of fertilizers, seeds mixtures and systems of sward management, and regular supplies of nutritious grazing can be guaranteed. Its full use is prevented, however, as in many other grazing districts, by various problems such as bloat and hypomagnesaemia, which are still the subject of scientific investigation.

The plentiful supply of grass, coupled with the improved dairy herds, has not surprisingly caused a continuing increase in milk production, whilst the number of cows in milk has tended to decrease. This is a step in the right direction, which would be one of real progress if only the greater use of grass could be reflected in a reduced consumption of bought feedingstuffs.

At the Farmers' Club

Progress in Agricultural Machinery

AT the Farmers' Club meeting on 3rd December, MR. W. H. CASHMORE, Director of the National Institute of Agricultural Engineering, complimented farmers and manufacturers on the advances in farm mechanization since 1939. Before then, much of our farm equipment had to be imported. For some time now, however, nearly all British farm machinery has been made at home, and annual exports, still rising, now stand at a value of over £100 million. In Britain we average one tractor per 27 acres of arable land, compared with one per 43 acres in West Germany and one per 103 acres in the U.S.A. Efficiency of production also compares favourably with that in other countries: for instance, compare the British farm worker's 17-ton grain output with the Western European average of 10 tons.

Though these figures may appear satisfactory, Mr. Cashmore emphasized that there is no case for complacency. He outlined four points of criticism. "Mechanization has not reduced the cost of production as much as might be expected. There is too great a variation between the efficient and the low efficient farms. Peak labour demands still exist that cannot be met by machinery. There is no precise information on the economics of mechanizing some of the smaller farms."

To balance these, he suggested four ways of bringing about improvements—greater reliability, improved design, new and improved techniques and equipment for applying them, and additional equipment to smooth out peak labour demands. The elimination of unnecessary types of implement and machine could best be achieved by close co-operation of farmer, manufacturer and research worker. This would be even more important when evolving new techniques, for farming practice may have to deviate still further from traditional methods.

In a personal survey, reasons advanced for unsatisfactory performance of farm machinery were: wrong choice 20 per cent, incorrect use 43, faulty machine 12, and doubtful causes, or a combination of reasons, 25 per cent. Mr. Cashmore considered that an approval scheme, advocated by many farmers for cutting out unreliable machines, would be difficult to operate, but public demonstrations such as the National Sugar Beet Harvesting Demonstration, which has been held annually since 1946, have proved their worth.

Co-operation between makers and users has stabilized the design of beet harvesters, and now 62 per cent of the crop is harvested by machine. Makers are concentrating on improving reliability.

By contrast, potato harvesting with machinery still requires considerable labour, damage is sometimes excessive and too many potatoes are left in the ground. One solution might be to breed a new variety of potatoes which could be lifted by their tops and then stripped of tubers. Two-stage harvesting might also help: potatoes lifted by a two-row elevator would be windrowed, then covered thinly with soil so that clods could disintegrate and the potato skins harden, to reduce damage in subsequent handling.

Mr. Cashmore forecast a quick swing to indoor storage of potatoes. A

logical development would be bulk transport from the field by tractor trailer or in 5 cwt crates.

With grassland, one problem is how to conserve grass at the early stage of growth when it is most digestible (65–85 per cent, according to research at Hurley). This stage is reached well before maximum growth, and before the customary time for hay- and silage-making. Medium quality silage is also needed and there is a good case for making some hay. It seems unlikely that the same machine could be used to make both hay and silage. Its low labour requirement makes the pick-up baler popular for haymaking, and drying may be finished off under cover at a cost of about 12*s.* per ton of hay dried, using a 12 h.p. motor and fan and a 30 kW heater.

The popularity of the flail type of forage harvester for collecting grass for silage has obscured the potential advantages of the cutter-chopper. This is worth considering because it could be used for hay, grass and even cereals. So long as silage involves a lot of hand labour, it will remain at a disadvantage compared with hay. Chopped material might bring improved handling and storage methods to silage-making, and to haymaking too, for chopped material might be easier to dry than baled.

Main improvements sought in combine harvesters are easier controls and adjustments, and improved separation areas to reduce losses, which are still too high. Transport vehicles, conveyors, etc., will be required to carry grain in bulk from the combine to the grain store.

The probable increase in home-grown foodstuffs will necessitate developments in mechanized mixing and cubing, after crushing and grinding. A cubing machine developed by the National Institute of Agricultural Engineering should interest the farmer with up to 40 dairy cows and followers: using 5 h.p., it has an output of 2 cwt per hour and low wear characteristics.

Soil physicists are working steadily towards the design of ploughs and cultivators for use at speeds well above those possible today. More one-way mounted ploughs are expected, for the flat surface they leave is becoming important for the efficient use of other machinery such as precision seeders, down-the-row thinners, and harvesters. With the mechanization of spring cultivations for sugar beet and other crops, and the possibility of pre-emergence weed control, machinery continues to bring radical changes in farming techniques.

With a self-aligning multi-tool-bar invented in the U.S.A., rowcrop work can be done by the tractor-driver single-handed. For roots grown on the flat, there is a British stabilizer that steers the tool-bar accurately at high speed during cultivations, guided by a deep slit cut into the ground in the initial operation.

In glasshouses, automatically controlled ventilation and watering guarantee correct management, as well as saving labour. Automatic livestock-feeding could come if stock were fed for a standard performance.

Mr. Cashmore paid tribute to the ingenuity of farm-designed improvements, suggesting that more counties should stage competitions at local shows, with winners competing at the Royal. Encouraging the farmer to take more interest in test reports, demonstrations and current research, he reminded his audience that in the problem of getting the best out of agricultural engineering and scientific agriculture generally, the farmer has the final choice.

Sylvia Laverton

In Brief

THE FARM IMPROVEMENT SCHEME COULD HELP YOU

More and more farmers, whether owner-occupiers or tenants are realizing that not to take advantage of the Farm Improvement Scheme will be to handicap themselves in the struggle for efficient production. Prices which may mean a fair income for the farmer with modernized, labour-saving buildings may give no return at all to his neighbour with antiquated buildings and an old-fashioned layout. Consideration should first be given to the financial aspect, since this is usually the chief difficulty. Advice should be sought on how, and to what extent, advantage can be taken of the one-third grant under the Scheme.

Here is an example of what a grant under the Scheme could do. Thatching costs may indicate that a new Dutch barn is needed; preliminary inquiries show the cost to be about £150 per bay, i.e., £600 for four bays. £200 could be recovered in grant, and a discussion with an accountant would probably show a considerable relief of income tax over the next ten years under a capital improvement claim; at 8*s.* 6*d.* in the £ on £400, this would be £170. Thus a £600 building could be obtained for a net cost of about £230. Financial circumstances should be much the same for all types of building improvements.

True, the Farm Improvement Scheme still leaves two-thirds of the capital to be found in the first place and the saving of income tax is spread over ten years. Then why not borrow the money? It makes sense to borrow money for a sound scheme which would bring in a profit, or a saving of labour costs, greater than the annual repayment. It is advisable to talk it over with a bank manager or accountant; if they think it a sound scheme they will advise on how to borrow the extra capital; if, on the other hand, in their independent judgment a scheme is financially unsound, it is as well to know beforehand.

These financial preliminaries may take some little time; but there is no need to be in a hurry—the grant will be available for the next nine years. Moreover, it is not restricted to one grant for one farm; provided the improvements are sensible and come within the terms of the Scheme, application can be made for grant on any number of separate items as long as work costing at least £100 is covered by the application. It is advisable, however, to have a master-plan for all the buildings on the farm, meaning by this a well-thought-out idea of the final aim. It should thus be possible to get on with one section of the plan at a time, without fear of regretting later that the first building erected is in the way of another.

Ask for a copy of Leaflet F1/1 at the local office of the Ministry for further details of the Farm Improvement Scheme and how it may help you.

R. G. Salter

BRITISH TRACTORS LEAD THE WORLD

The British agricultural tractor industry is booming, as mechanization goes steadily forward not only in Western Europe and North America but also in countries which, for thousands of years, have followed farming methods of the most primitive kind. Figures supplied by The Society of Motor Manufacturers and Traders show that in 1957, Britain produced nearly 185,400 agricultural tractors, of which we sold some 115,000 overseas. By comparison, Western Germany produced 158,500, of which 35,800 were exported, and even the United States (for many years the major tractor-exporting country in the world) shipped less than 50,000 units abroad during the same period.

Britain's tractor industry expects to retain her position as top exporter of tractors in 1958; exports up to the end of June this year already numbered some 57,300 units.

Over 48 per cent of our tractor exports in 1957 went to the sterling area, and 38 per cent to Europe: Canada and the U.S.A. took 5.7 per cent. In the first six months of this year the trends were roughly similar.

GASSING OF PIGS BEFORE SLAUGHTER

Under the Slaughter of Pigs (Anaesthesia) Regulations, 1958, which came into force on 1st December, pigs may in future be "put under" before being killed. These regulations permit pigs to be anaesthetized by carbon dioxide gas in special installations at slaughter-houses in England and Wales. Previously they had to be killed or stunned instantaneously. Before making the regulations, the Minister consulted the R.S.P.C.A. and other societies concerned with the welfare of animals.

The gassing process is already used abroad. Although there are several designs of installation, they all work on the principle of conveying the pig into a chamber containing carbon dioxide, where it becomes insensible in a few moments. It is then killed before it can recover consciousness.

All available evidence is that, operated with reasonable care, this process is humane. Nevertheless the regulations include a number of safeguards: for example, the local authority must be satisfied before the installation may be used, people concerned with operating installations must be instructed, the concentration of the gas—which must be neither too low nor too high—must be sufficient to render the pig insensible to pain until it is slaughtered, and one of the recognized instruments for stunning animals must always be at hand in case of a fault in the gassing arrangements.

The Minister is satisfied that the carbon dioxide has no harmful effect on the meat. The process is most likely to be used at large bacon factories.

SWEDES FOR STOCK-FEEDING

The right choice of swedes for stock-feeding is an important economic consideration, and therefore the N.I.A.B.'s free leaflet (No. 7) which lists and advises on the varieties that have done well under trials is worth sending for. Since 1953 more than 130 British swedes have been tested and grouped into five major types, according to skin: Light Purple, Dark Purple, Green, Bronze and Hardy Dark Purple.

Trials of Light Purple are further advanced than those of other groups and this type is probably the most widely grown. The leaflet confines itself to varieties within that group—globe-shaped, intermediate and tankard.

For general use, the dry matter yield of the roots should be a main criterion for choice of variety. Both winter hardiness and maturity are associated with dry matter content, higher dry matter being more usual in the more hardy and later strains. The tankard shape is probably best suited to feeding on the land. Too long a neck can cause harvesting difficulties, especially in certain seasons, while extremely short-necked strains are often preferred for the human consumption trade. Large tops tend to protect the roots from frost: their shade often results in a less deeply coloured root.

None of the Light Purple varieties tested were markedly resistant to either club root or mildew. Some of them were liable to split under certain conditions.

THE N.F.U.—FIFTY YEARS

Partnership between agriculture, science and engineering was the theme of the N.F.U. Jubilee Dinner held at Grosvenor House, in London, on 17th November. Congratulations were received from Her Majesty the Queen.

The Prime Minister proposed the toast of "agriculture" and Sir James Turner, President of the National Farmers Union, responded. Sir James said that the

presence of Mr. Macmillan not only did honour to the farming community but showed the importance attached by government to the life and work of farmers and growers. Paying tribute to two distinguished former Ministers of Agriculture, Mr. Tom Williams and Mr. Heathcoat Amory, he said that each of them was known for significant agricultural legislation designed to incorporate stability with efficiency. Referring to the Small Farmer Scheme, Sir James said that the same might be said of the present Minister, Mr. John Hare.

Responding to the toast of the guests, Sir John Russell recalled the struggle he and others had had to infuse more science into British farming. Today, the picture was very different. Science was accepted by the farmer, and agriculture had at its service a band of devoted and energetic scientific workers, patiently probing the secrets of nature and trying to use the knowledge gained for making the earth increase her output.

The origin of the N.F.U. lay in a rainstorm and nine farmers sheltering in a hut at Harmston Park Puppy Show. Looking into a future wherein free trade in foodstuffs was likely to raise a continuing crop of problems for British farmers, they considered what co-operative effort could be made to meet them. Lincolnshire was the ground out of which it grew, and, by 1908, under Colin Campbell (one of the founder members) the N.F.U. had risen to the status of a national organization.

Today the N.F.U. has some 200,000 members, with 59 county and over 1,200 local branches serviced by a full-time staff.

BULK HANDLING OF GRAIN AND FEEDINGSTUFFS

In the U.S.A. grain is handled in bulk at all stages—from field to ultimate user. We, in Britain, are moving steadily in the same direction. Naturally, such radical changes as are involved could not be expected overnight; nevertheless the increase in the number of combine harvesters being used by farmers (from some 22,000 in 1953 to about 43,000 in 1958) has been setting a very hot pace for merchants at harvest time, and interest in harvesting in bulk is accumulating. Meanwhile, much valuable experience has been gained by hauliers and merchants in vehicle design and handling methods.

At such a stage of development it is often nobody's business to collate information and set an agreed standard to which all may conform. It is to the credit of the Council of the National Association of Corn and Agricultural Merchants that they have not let the opportunity pass. Under their sponsorship, a working party has with commendable celerity produced an agreed code, *Notes for Guidance on Bulk Handling Equipment,* which is obtainable from the Association at Cereal House, Mark Lane, London, E.C.3, price 6*d*.

The booklet does not go into great detail, but it gives the facts and main requirements for the farmer, the merchant, the haulier and the ultimate user. It also takes into account the growing practice of delivering bulk feedingstuffs to the farm and offers suggestions on hopper containers, unloading rates and vehicle construction. A systematic, orderly and profitable change in the handling of grain may well spring from the guidance here given.

BULLOCK POWER FOR ELECTRICITY

Most of the time bullocks lead an idle life in India, roaming the village streets, but by harnessing a pair to a specially-designed generator, enough electricity is produced to light 150 village huts or operate a small village industry employing 25-50 men. A bullock-powered pump unit gushes 150 gallons of water a minute, enough to irrigate 100 village acres.

Foreign Agriculture

Book Reviews

British Trees and Shrubs. (Kew Series, Vol. 2). R. D. MEIKLE. Eyre and Spottiswoode. 25*s*.

Here is a welcome addition to the books available to keen amateur naturalists and students of botany. All the British and naturalized trees and shrubs the reader is likely to find, including some less well-known species, are described under their scientific names and in the context of their families. In the introduction, the structure of woody plants and the function of the parts are clearly described with the aid of diagrams. The principles of classification and nomenclature are lucidly explained, and an eight-page glossary gives easy reference to the scientific terms used throughout in the interests of accuracy and brevity. The book forms an excellent introduction to the more advanced works cited in the bibliography, but common names are given for all plants which have them, and a beginner should be able to follow the text.

A straightforward key, using only readily observed characters, enables a normally grown specimen to be assigned to its genus, for which the page reference is given. Black and white drawings of twigs, leaves, flowers and fruit of 84 species provide a check on identification based on the key and text, and close relatives among cultivated plants are mentioned. The fifteen glorious coloured plates make the book very attractive. Most of them illustrate well-known species, and encourage the reader to look more closely at some beautiful plants which lack the appeal of novelty.

The botanical descriptions and notes on habitat, distribution, pollination and the origin and meaning of the scientific name are thorough and accurate, as we should expect from a member of the staff of the Royal Botanic Gardens, Kew. The writing, however, is never pedantic. The author's interests extend far beyond the limits of academic botany; the descriptions of special properties and uses of the plants are fascinating and sometimes humorous, and the notes on pests or diseases commonly found on the plant are particularly useful.

There are no pictures of growing trees or shrubs, but they would have added considerably to the size and cost of the volume, and one would not wish to see anything omitted from this delightful book to make room for them.

J.M.T.

The State of British Agriculture, 1957–8. K. E. HUNT and K. R. CLARK. Agricultural Economics Research Institute, University of Oxford. 10*s*.

No industry is better served statistically than agriculture. So much is published, and in so many places, that, as any searcher soon discovers, this richness may become an embarrassment. It is therefore with gratitude that we welcome this volume—the third in a series which began in 1954—as a valuable companion to the recently revived *Agricultural Register*.

The new publication does not merely present a compact statistical survey of contemporary British agriculture in all its guises—as producer, consumer, competitor, employer, and recipient of State support: it also sets these aspects within the historical pattern, and against a background of world intelligence. Moreover, it introduces each facet of the subject with a short, pertinent discourse which, while revealing the dangers of reading too much into the figures, skilfully points to the various arguments to which farming statistics can—and invariably do—lead.

The authors have, in general, most ably avoided confusion arising from varying bases or definitions of area—a difficulty well known to students of agricultural statistics. But I suggest that in future editions standardization, with the United Kingdom as a base, would be valuable; where this is not possible, a note of explanation would be helpful.

Perhaps only economists will read this book right through in cold blood. The ordinary mortal can only browse in its fascinating pages. In so doing, he may discover the disturbing fact that 1,293,000

acres of England and Wales are "unaccounted for"; or the comforting evidence that our farmer population has remained stable for over a century. The news that disposals of whisky—of which 200 million gallons remain in stock—are believed to have reached their ceiling may leave him cold. But he should be moved to serious reflection when he learns that in Britain the share of Government agricultural support devoted to research, education and advice is—at 3 per cent—the smallest in Europe: for example, in Denmark it is 36 per cent, and in the Netherlands, 15 per cent.

A comprehensive and useful work such as this deserves less bulky presentation. More up-to-date methods of document reproduction might help here—perhaps a good opportunity for a benefactor's help.

G.C.

The Bird Lover's Bedside Book. Edited by R. M. LOCKLEY. Eyre and Spottiswoode. 18*s*.

The habit of reading in bed seems to be growing, if we may judge by the number of books which are being designated as "bedside reading". Either they are sleep-inducing, as an alternative to the older device of counting sheep (and what farmer, it may be asked, wants to do that?) or they are an early morning exercise to ease the mind into the cares that infest the day—and certainly no farmer has time for that! In essence, the bedside book is usually composed of carefully considered trifles, gathered by the affectionate hand of the compiler and presented, like coloured beads, on the thread of a single theme.

Such is this book of Mr. Lockley's. Within its 330 pages he has brought together selected verse and prose from over a hundred writers—from the "abominations" of Leviticus to the raptures of Shelley for the skylark and Walter de la Mare for the linnet. Some old favourites crop up, like Keats's *Ode to a Nightingale*, Robert Browning's *Home Thoughts from Abroad* and Richard Jefferies' observation on birds' nests. But for the most part the pieces are likely to be new to all except the most enthusiastic ornithologists: modern authors are well represented.

If you like reading about birds, their song, flight, behaviour and the stories men tell about them, you cannot do better than take the implied advice of this book's title. You may well go on turning its pages whilst the electricity meter records the mounting units unheeded.

S.R.O'H.

Wye College Department of Hop Research Annual Report, 1957. *5s.*

These annual reports, which are circulated to all hop growers by the Hops Marketing Board and to many brewers by the Institute of Brewing, serve the good purpose of keeping both industries promptly informed on current research. The accounts of the hop season in the West Midlands and South Eastern Regions, by the N.A.A.S. Hops Advisory Officers, and the results of analyses of samples entered for the exhibition of new varieties, provide a useful permanent record of the culture and quality of hops for the season.

Progress reports from the various sections of the Department review the year's work, and more detailed reports are given on work which has reached the stage of showing definite results.

Interim results on the trials of heights of wirework and spacing of the plants give a useful guide for those planning new gardens. It is good to learn that these trials which were interrupted by an outbreak of *Verticillium* wilt—now fortunately overcome—are to be re-established.

Experience in 1958 has emphasized the need for further knowledge about the growth and behaviour of downy mildew. Growers will be glad to hear that work on this subject, and on the breeding of varieties resistant to the disease, is being actively carried on.

The production of polyploid forms of hops is an important aspect of the work; this was primarily aimed at producing varieties tolerant to *Verticillium* wilt and having Fuggle and Golding characters, but it is also giving promising results in other directions.

Even when fully pollinated, triploid hops have a low seed content. So it is proposed to breed these types from Continental varieties with a view to producing one, that can be grown in this country, which may be suitable for brewing lager beer. Triploid cones also appear to shatter less in machine picking—another desirable character.

A.H.B.

The Museum of English Rural Life Report, 1957. University of Reading. 1*s.*

The third annual report of the Museum of English Rural Life, Reading, continues the story of development and expansion. In 1957, two temporary exhibitions were held, one on cattle and sheep from 1750 to 1850, the other on the history of rural cricket, and the collection was increased by over four hundred accessions. A special article describes the system of accession records to which the items exhibited owe so much of their value. For tools and pieces of equipment are little more than interesting relics until their physical and economic background is known, and they can be related to other survivals from the same trade or area.

The exhibition of objects and pictures, however, is only part of the work of the Museum, which is primarily a centre of research. It is significant that the report refers gratefully to the number of visitors who have become voluntary field-workers, for the Museum and its colleagues are engaged in a race against time, striving to record the material evidences and memories of our rural past before they perish. The modern age with its buses and schools, wireless and television, machinery and conscription, is the careless foe of the technologies and traditions of Old England. In a decade or so there will probably be nobody left in this country who can make a flail without looking it up in a book; who has felt the floor of a working windmill vibrate under him; who has seen the mummers or heard the "rough music" of the skimmity ride.*

Hence the peculiar value of such field-studies mentioned in the report as the cataloguing and analysis of five hundred farm waggons, and the photographic recording of coopering, chair bodging and other country crafts. We of today are not unappreciative of the work of the Museum, as the number of visitors shows. But it is our grandchildren who will appreciate its value at its true worth.

N.H.

* *A skimmity ride. A concerted effort by a whole village to express disapproval of some action by an individual. The villagers make as much noise as possible outside the offender's home, and in extreme cases he or she may be escorted to the village boundary. Ed.*

Chemical Year Book, 1959. 2*s.* 6*d.*

A useful and stout little book has been produced by Bradford and Sons Ltd., Yeovil, listing the weed-killers, fungicides and insecticides available to farmers and growers, with makers' recommendations for their effective use.

Books Received

Report on the 1950 World Census of Agriculture. Vol. II: Census Methodology. F.A.O., Rome. H.M. Stationery Office, London. 10*s.* (10*s.* 11*d.* by post).

Agriculture in Britain. Obtainable from Central Office of Information, Reference Division, Distribution Unit, Hercules Road, Westminster Bridge Road, London, S.E.1. 1*s.* 9*d.* (1*s.* 11*d.* by post).

The British Council Annual Report, 1957–58. British Council. 1*s.*

Norfolk Agricultural Station, Fiftieth Annual Report, 1957–8.

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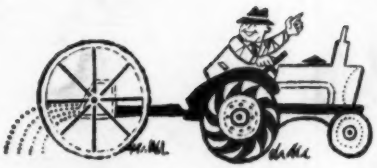

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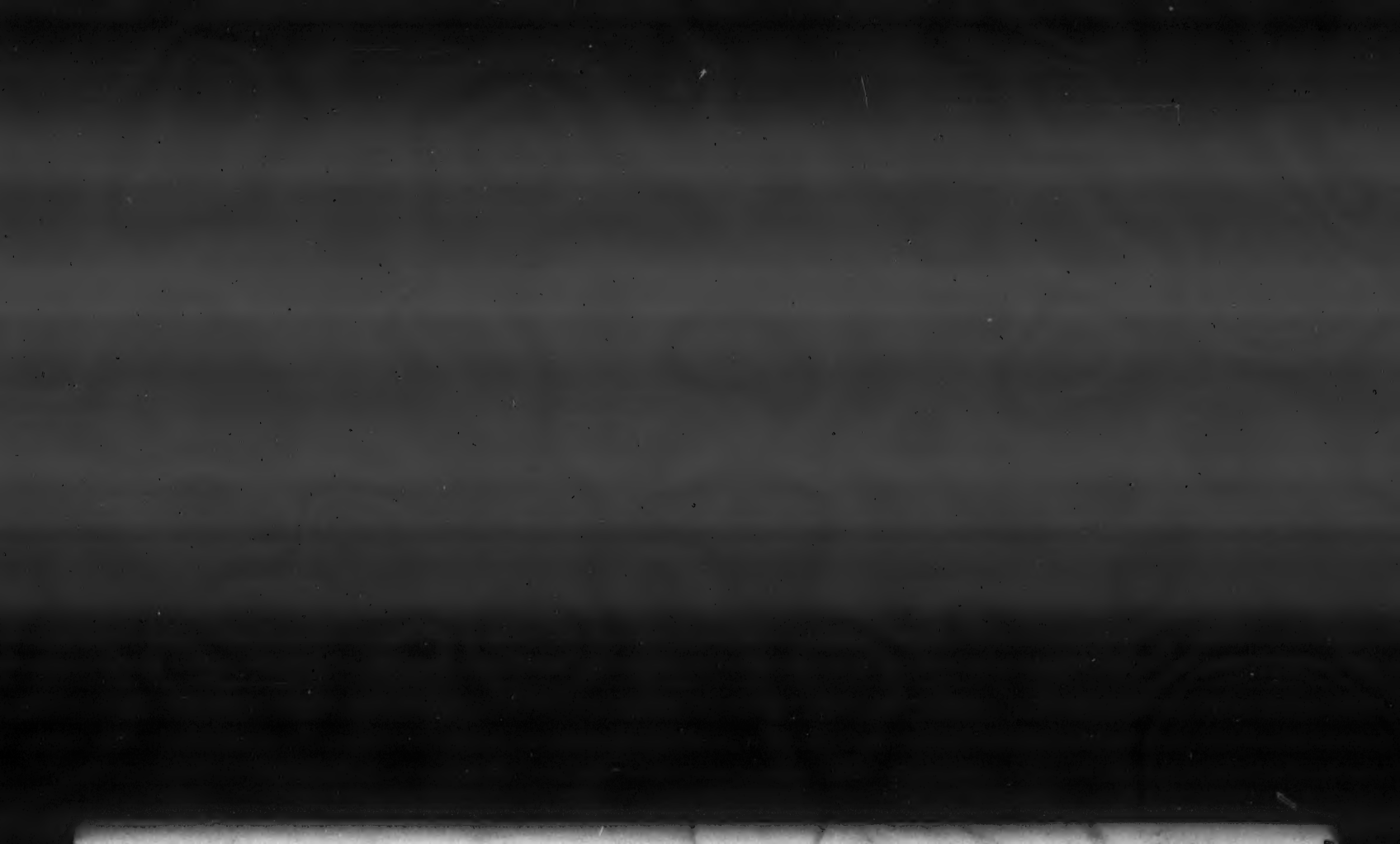
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